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THE AUTOMOBILE

LATEST FOREIGN PRACTICE

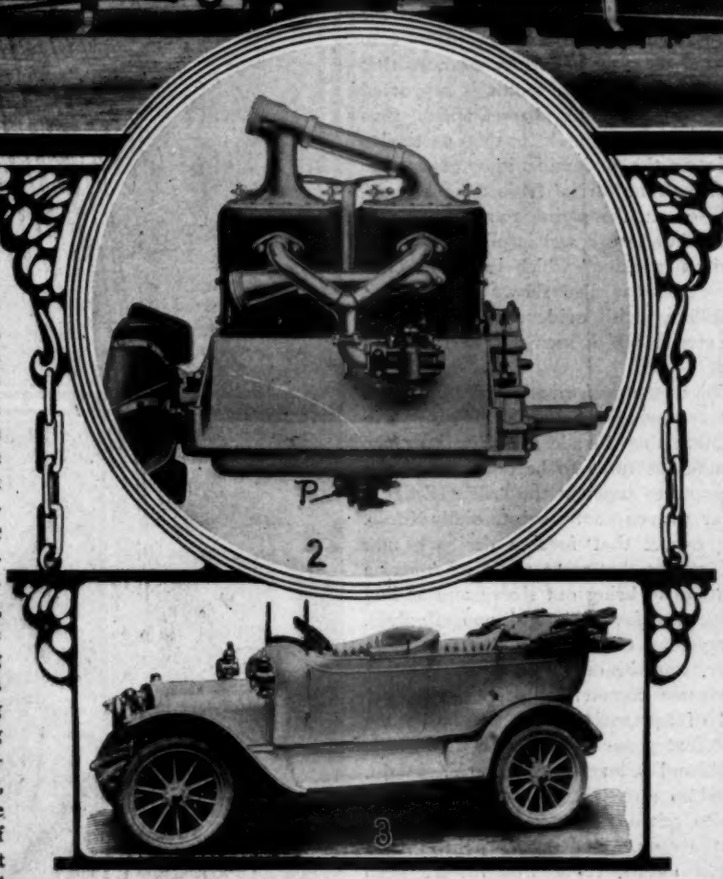


Fig. 1—Side view of 40-horsepower Rolls-Royce chassis
Fig. 2—Right-hand side of the 18-24-horsepower Deasy motor
Fig. 3—White car with an English torpedo type of body

REVIEWING the exhibits at the Olympia Show, which is now being held in London, would offer few advantages as compared with the picking out of the more important new features, discussing such details as will be of interest to automobile engineers in America. While it is interesting to know that the small-car craze is spreading over Great Britain, it having completed its first cycle on the Continent, this information is lacking in detail, just as the statement that the long-stroke idea is persisting fails to impress anyone on a practical basis. Just so long as the reference to the long stroke is confined to the single-cylinder types of motors, with a bore of something like 3.9 inches and a stroke of approximately 9.6 inches, it is easy enough to understand what long stroke means. It is a far cry from this truly long-stroke plan to the claim that a motor is of the long-stroke variety if, perchance, the stroke happens to be an inch more or less than the bore. Standing on a technicality is what it all amounts to, and to some extent the reports that emanate from the Olympia Show seem to indicate that for advertising purposes technicalities are taken advantage of. In order to be able to discriminate between the material facts from the point of which was recently held in automobile making and the immaterial technical claims, THE AUTOMOBILE has taken the pains to have a technical man of skill go over the exhibits, have them photographed, and it will be the purpose here to show by photographic reproduction the things that might be worth perpetuating by automobile engineers in America. But the mere fact that a thing is good does not necessarily mean that it should be adopted in place of some other device that is serving its purpose efficaciously; it is fortunate that most problems may be solved in two or more ways and there is more than a possibility that a solution which is highly efficient from the point of view of English practice would prove to be a poor plan in America if for no other reason because the roads are not so good.

In order to appreciate the general plan of the British automobile builder of skill and discrimination it will be necessary to examine Fig. 1 of the new 40-horsepower Rolls-Royce chassis, which was one of the most admired examples of chassis work in a long list of 1911 automobiles. Since it is not the purpose

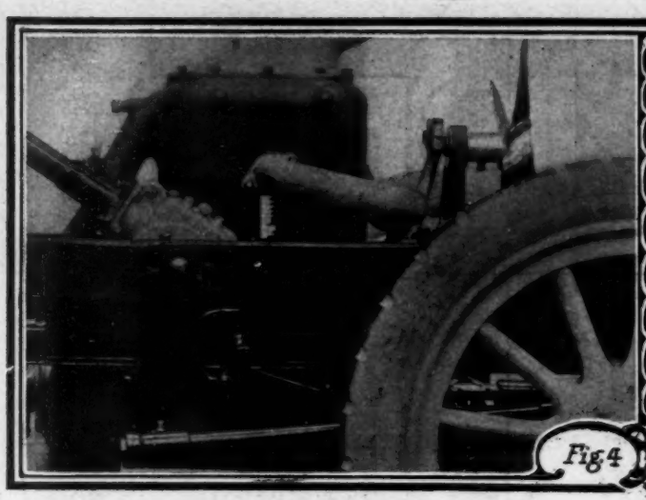


Fig. 4

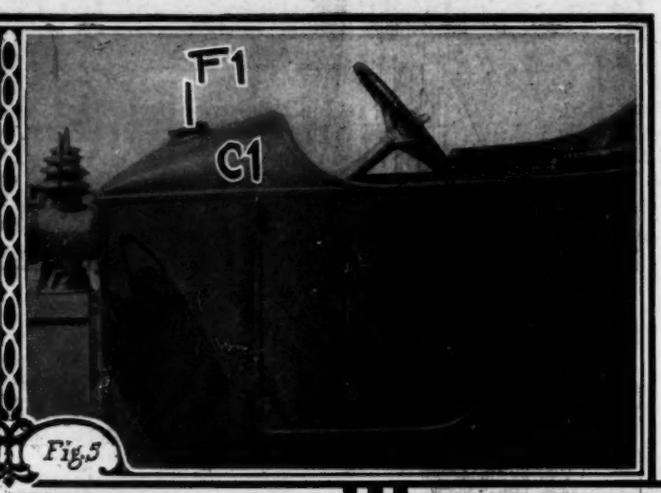


Fig. 5

here to delve into the details of the cars from a buyer's point of view, the reader is requested to pass on to Fig. 2 of an 18-24-horsepower, four-cylinder Deasy motor, in which the bore is 90 and the stroke 130 millimeters. The fan veins are on the exterior of a bowl-shaped flywheel and the water piping for the thermo-syphon system of cooling is trumpet-shaped at the fastening extremity. Attention is also called to the large area of the water piping and the high riser from the top of the cylinder to the main branch. Beyond this point it is worthy of note that the general designing is symmetrical and the motor is supported by webbed flanging with fastenings on the chassis frame, thus eliminating the need of an underpan, and in this particular example, the oil pump P is on the underside in a get-at-able position, with the chance perhaps that "drift" from the road surface might damage the pump or put the piping awry.

Fig. 3 is an example of the White car and is offered here as an indication of the "American invasion" which is now assuming substantial proportions. This car also shows an excellent example of British body-building, with evidences of style and of display of that smooth exterior which seems to be the thing abroad.

Mutterings of dissatisfaction at the performance of the various sleeve types of motors that are being developed in Europe are now so loud and persistent that they invade the editorial office of THE AUTOMOBILE with sufficient force to be noticed and the main cry is that all the attempts to supplant the "silent Knight" type of motor have thus far proven to be substantially futile. It is perhaps too much to expect that foreign designers are aware of the long series of efforts that were made in America as far back as twenty years ago to bring out sleeve and sliding types of valves that would compare favorably with poppet valves. As a matter of fact, the Raymond engine, with a rotary valve in the head of each cylinder, was the only one of the lot that survived long enough to assume commercial proportions, and it cost in the neighborhood of $400,000 for the makers of the Raymond engine to find out that poppet valves were better. It was on account of these trials and failures that Chas. Y. Knight, of "silent Knight" fame, had to go to England to "float" this type of engine, but, strange to relate, the American public tired of the idea just one motor too soon. Had it been a little more patient, accepting the Knight motor, there would have been ample compensation for the many failures experienced and the Knight motor would have been serving on American automobiles to-day instead of on the British Daimler, an example of which

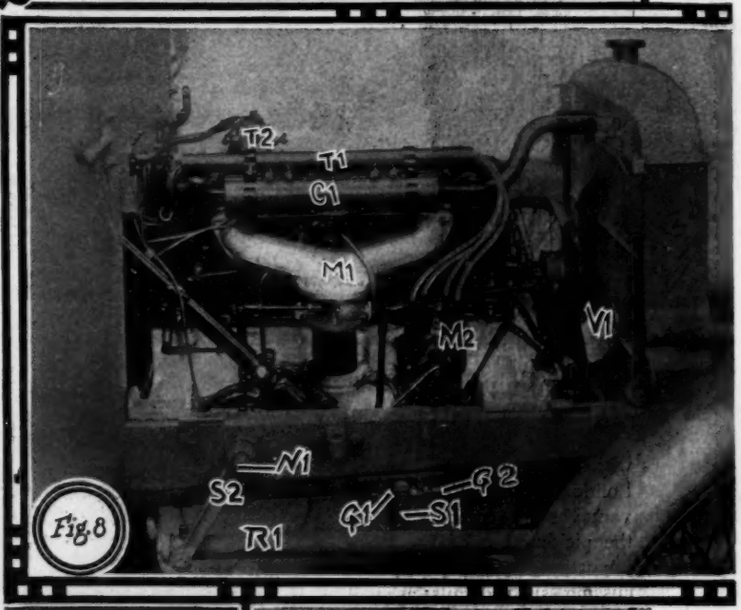


Fig. 8

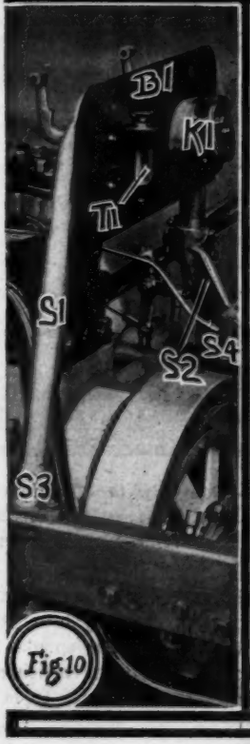


Fig. 10

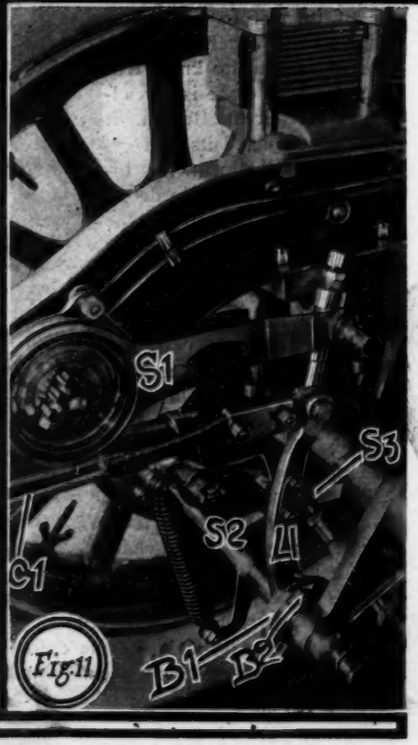


Fig. 11

Fig. 4—10-12-horsepower, two-cylinder Swift motor

Fig. 5—Location of the gasoline tank of the 15-horsepower torpedo type of Argyl

Fig. 8—Details of the 38-horsepower Knight motor in a Daimler chassis

Fig. 10—Dashboard construction of the 15-horsepower Daimler chassis

Fig. 11—Rear construction of the 40-horsepower Rolls-Royce chassis

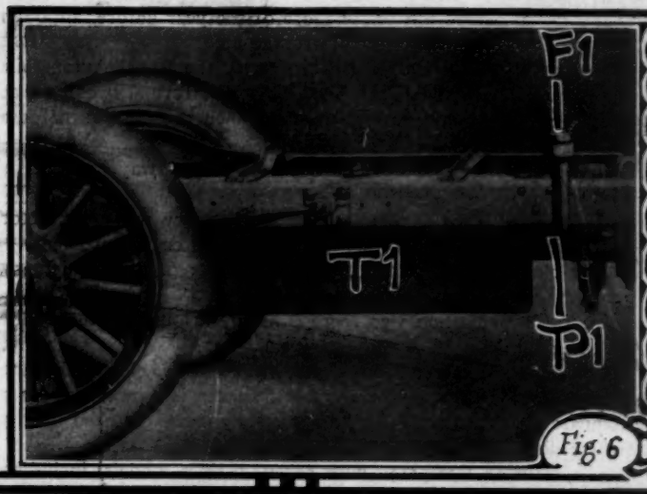


Fig. 6

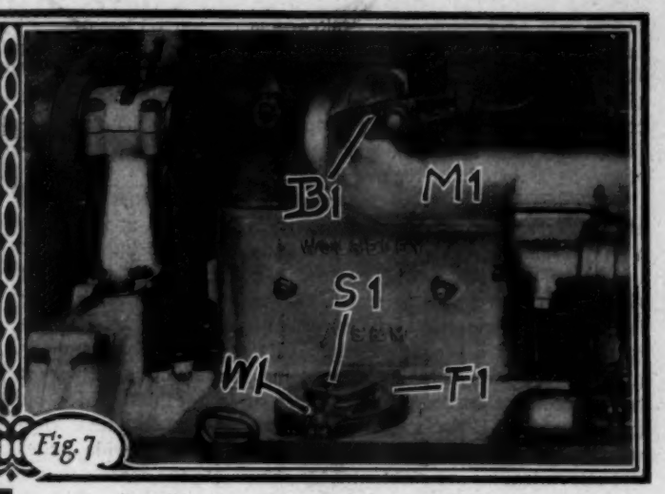


Fig. 7

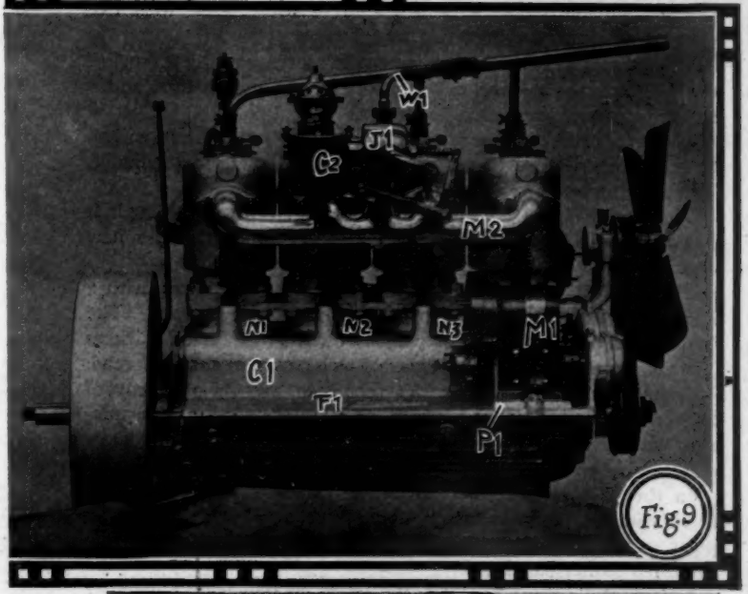


Fig. 9

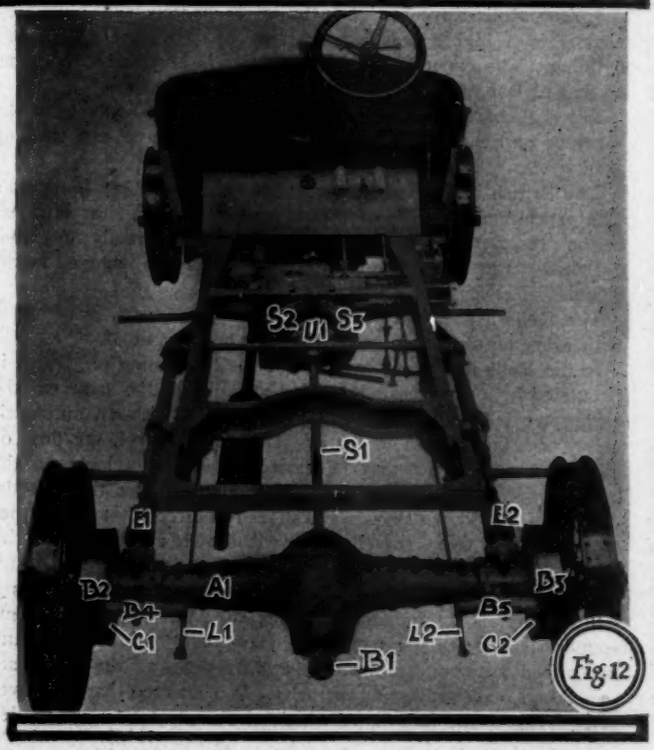


Fig. 12

is shown in Fig. 8, of a 38-horsepower sleeve type of Knight motor. The motor nests in the automobile without looking different from poppet valve types of motors, but attention is here called to a few ramifications, notable among which is the cylindrical spark coil C1, lying along the carbureter manifold M1, with the carbureter below, and the magneto M2 to the fore, with its high-tension leads curling up into a distributing tube T1 on the top of the motor, and for auxiliary ignition purposes the timer T2 shows above the top line of the motor in front of the dash. From the purely mechanical point of view attention is called to the curved veins V1 on the air propeller back of the radiator. The rear shackle S1 of the half-elliptic front spring slides in a cylindrical guide G1 and a grease cup G2 is provided for purposes of lubrication. The English idea of stability of the steering equipment will be appreciated by observing the size of the drag-rod R1, and the steering arm S2 is keyed to the steering gear spindle with a lock nut N1, the spindle coming through the chassis frame in the neutral section, which is half-way between the top and bottom flanges. In other respects, it cannot be claimed that this construction is a great advance. The radiator is extremely heavy and the auxiliaries to the motor seem to be slovenly installed.

In small motor work, to show the trend, attention is called to Fig. 4 of the 10-12-horsepower, two-cylinder Swift design, which is placed in a light construction chassis with relatively large diameter wheels and liberal sizes of pneumatic tires, thus indicating that in English practice the aim is:

(a) Economy of fuel.
(b) Limiting maintenance cost of tires.
(c) Moderate speed.
(d) Good roads.

Referring to Fig. 12 of the 18-24 Deasy chassis, there are a few details that may be worth noting, as, for illustration, the live rear axle A1 is split in the vertical plane and many bolts are used in the clamping together of the two halves. The propeller shaft S1 is of small diameter and relatively long. It is provided with a worm meshing with a worm wheel on the differential within the enlargement of the live rear axle, and the end bearing B1 of the propeller shaft shows clearly at the back. The service brakes with two shoes S2 and S3 are in front of the universal joint U1 at the point of securing of the forward extremity of the propeller shaft S1. Perhaps the equalizers E1 and E2 on the distance rods will attract some attention. These equalizers are spring actuated, comprising a cylinder and a

Fig. 6—Location of the gasoline tank on the 24-30-horsepower, six-cylinder Wolseley

Fig. 7—Provision for the storage of lubricating oil in the 50-horsepower, six-cylinder Wolseley

Fig. 9—Scheme of design of the individual-cylinder, 15-horsepower Austin motor

Fig. 12—Looking at the rear of the 18-24 Deasy chassis

piston with limit stops. The brakedrums B2 and B3 are of good diameter and the covers C1 and C2 are tight, thus excluding foreign matter. The actuating levers L1 and L2 are keyed and pinned to camshafts with large bearings B4 and B5, making the construction substantial, but perhaps a little heavy. The remaining details of this chassis, looking at it from the rear, are sufficiently brought out to require no further comment.

Referring to Fig. 11 of the rear of the Rolls-Royce chassis, attention is called to the shock absorbers S1 placed at the inside of the frame at the point of curvature of the kickup, also to the brake adjustment B1, comprising a flanged portion on the shaft S2 and a flange to match on the lever L1, with holding bolts B2 engaging the two flanges with an interlocking means in the form of a seriate of edge-like teeth. The limit stop S3 prevents the lever L1 from oscillating, something of this sort being necessary on account of the use of wire cables C1 for the pull member. There are other indications of substantial construction and the three-quarter elliptic springs of wide plates and eleven laminæ are substantially anchored to the chassis frame.

Another idea which crossed the "Western Ocean" and took lodgment in the crop of a British designer is shown in Fig. 9 of the Austin motor of the four-cylinder type, individual style. The cylinders are shortened and necks N1, N2, N3 and N4 extend up from the aluminum crankcase to make up for the difference in distance. The Simms magneto M1 rests on a pad P1 of the flange F1, extending out from the upper half of the crankcase C1, the magneto being held in place by a steel strap with a foot and a holding bolt. There is one other point in relation to this motor that did not come from America; it is represented in the carbureter C2, located above the intake manifold M2, with a hot water connection W1 to the carbureter jacket J1.

It is just possible that the location of the gasoline tank in the 15-horsepower Argyl, Fig. 5, will be of interest to some American designers. The filler F1 is in the overhanging cowl C1 and the tank occupies the space beneath the overhang and between the dash line and the post of the foredoor. It extends down far enough to afford the requisite gasoline capacity without interfering with the foot room of the occupants of the front seat. Another idea in gasoline tank locations is shown in the Wolseley 24-30-horsepower, six-cylinder model, as presented in Fig. 6, showing the gasoline tank T1 in the fore and aft position on the right-hand side of the chassis in front of the rear axle with the filler F1 outside of the chassis frame and a curved filler pipe P1 passing around the frame and inboard to the front end of the gasoline tank.

The disposition of the lubricating oil supply is evidently regarded as extremely important in 1911 British automobiles and a good example of the most exacting type of practice is shown in Fig. 7 in connection with the 50-horsepower Wolseley, in which the filler F1 for the lubricating oil is in an extension of the crankcase on the left-hand side of the motor just back of the radiator. This filler has a large diameter cap with a wing nut W1 for quick release and a screen S1 placed to keep dirt out and making it possible to use this cap as a "breather." The method of holding the intake manifold M1 comprising a bridge coupling B1 is quite common practice in many of the cars.

As a slight advance over common practice the dash mounting of the Daimler chassis as shown in Fig. 10 is mentioned, presenting stanchions S1 and S2 in sockets S3 and S4, to which the dashboard B1 is secured, the dimensions of the latter being barely sufficient for the kick switch K1 and the telltale T1. When the body is taken away the skeleton-like dash opens the way to the motor at the rear end for inspection and other purposes. When the body is in place this form of dash presents the customary good appearance.

What the Experts Say About the Olympia Show

The genuine buyer was protected by having to pay extra admission; the charge was five shillings on November 8, which was the day set apart for the elimination of the goats by this simple expedient.

Individual orders fell below those of the year before, although it is predicted that the end will average up.

Owing to the death of the chairman of the Royal Automobile Club, H. R. H. Prince Francis of Teck, the formal opening was dispensed with, and the annual press dinner was postponed for a year.

It seems quite certain that the show in every way justified its existence.

Mechanically, the lesson learned at the show was that motor manufacturers have been struggling with the engine problem.

It is claimed for the 1911 product that it represents quietness, economy in gasoline, general flexibility, etc.

The steam situation was represented by a lone car, the White —American.

Quoting the expert: "Every maker, of course, claims absolute silence for his own particular make; silence is, however, only a comparative term, and we have not by any means reached finality in this direction."

The Daimler Company, with seven distinct models, including three 6-cylinder types, with worm drive back axles, with two exceptions, is the center of attraction.

The highest worm drive equipment is represented by a 6-cylinder Daimler, the motor having a bore of 101 millimeters, and a stroke of 130 millimeters.

The smallest Knight engine is rated at 12 horsepower with a 69 millimeter bore, and a stroke of 114 millimeters, 4-cylinder. This motor is cast *en bloc*.

The leather-faced cone clutch is holding its own, although it has always had the preference in Daimler practice. The new Daimler cars dispense with the accelerator pedal.

The smallest Wolseley car is rated at 12-16 horsepower, with a bore of 3 1-8 and a stroke of 4 1-2 inches, 4 cylinders. The Wolseley Tool & Motor Company is owned by Messrs. Vickers Sons & Maxim, so that it is regarded as a power in shaping trend.

The Wolseley Company works 4,000 men, and its plant covers 24 acres. The Wolseley former practice included a transmission with direct drive on the third speed. The new product gives direct drive on the fourth speed.

In the 50-horsepower Wolseley the transmission gear box is fitted with an oil pump which forces the lubricating oil through pipes so that it impinges on the teeth of the meshing gears—this is a step to noiselessness.

In the Rolls-Royce exhibit the 40-50 horsepower, 6-cylinder chassis is a highly polished example of attractive automobile building. The expert says: "The chassis is practically the same as that of last year with a few detailed improvements."

The dashboard on a Rolls-Royce is clean. The control for the magneto and carbureter was removed to the top of the steering post.

The British idea of nomenclature is undergoing crystallization. The expert states: "One of the difficulties of the motor business at the present time lies in the fact that there is really no actual definition as to how much or how little should be included in the chassis."

The Rolls-Royce chassis, according to the expert, is provided with every possible adjustment that can be thought of.

In the Rolls-Royce car pressure of the lubricating oil, which is circulated by a pump, can be varied at will. In the same car the carbureter is of the multiple-jet type, fitted with an automatic valve, and, in addition to the usual throttle control, the flow of gasoline from the jet may be varied at will by a lever on the steering gear. A centrifugal governor also actuates the throttle.

In the Rolls-Royce chassis an oil feed is directed at the leather of the clutch; when the clutch is withdrawn a minute quantity of oil is permitted to pass onto the leather. The 14-16 Delsize chassis, with the same dimensions as the small Wolseley, has a selling price of 255 pounds sterling; the Wolseley price is 400 pounds sterling; this statement indicates that there are high and low-priced automobiles, without a difference, as the purchaser sees things, excepting as to the price. It is claimed that the lower price is due to the fact that the maker concentrates on one model.

Hickory

EXTRACTS FROM A BULLETIN, ISSUED BY THE FOREST SERVICE, UNITED STATES DEPARTMENT OF AGRICULTURE; CONCERNING ITS USE IN AUTOMOBILE WORK, WASTE, AND RENEWAL; TESTS AND COMPARISONS

OF American hardwoods entering into the construction of automobiles none would be more difficult to replace than hickory in case of a shortage in supply. Hickory is not remarkable for beauty of color or of grain, it shrinks badly in drying, it is not durable in contact with the ground, and it is very liable to attack by insects; on the other hand it is heavy, hard, strong, stiff, and very tough. No other commercial wood, native or foreign, combines these properties to so great a degree.

The Forest Service has co-operated with the National Hickory Association, an organization of the users of hickory who have foreseen a coming shortage in the supply, and who have united to help prevent it, to study the different species, and to suggest means to produce and maintain the necessary supply.

The census returns for 1908 show a cut of about 200,000,000 board feet. This is intended to include, however, only the material actually cut and sold as lumber, while much of the hickory cut is not lumber. In 1908 an additional cut, equivalent to about 135,000,000 board feet, was worked up directly into other products, such as spoke billets, handle blanks, and rim strips, difficult to reckon in board feet. This gives a total consumption, excluding fuel, of about 335,000,000 board feet, allowing for all necessary waste. If, however, the unnecessary waste, both in the woods and at the mill, were included, the total amount of hickory consumed would probably be not less than 450,000,000 feet.

The vehicle industry in America uses more hickory than any other, is most dependent upon it, and takes about 65 per cent. of the total cut, of which more than one-half is used for spokes. About 1 per cent. of the annual cut of hickory is used in the manufacture of automobile spokes and wheel rims.

To give a relative idea of the real meaning of this statement, the American automobile industry last year used approximately 800,000 wheels, containing about 9,000,000 spokes, not to mention an enormous additional amount of material necessary for the construction of the felloes.

Manufacturers of heavy wagons consume about 9 per cent.; the tool-handle industry about 10 per cent.; the agricultural-implement business about 8 per cent. and oil wells about 2 per cent. of the annual hickory output, together about 95 per cent. of the total cut. The other 5 per cent. is used for many special products.

It is probable that the greater part of all the hickory cut is used for fuel, and this portion may amount to 1,000,000 cords.

A great deal of American hickory is used in the vehicle industry abroad. It is exported chiefly in the form of bent rims, spokes, and shafts, but a great many finished wheels and logs are also sent. About 5 or 10 per cent. of the annual output is used in this way. In addition, large quanities of hickory, both in finished and unfinished form, are sent to Canada. About 40 per cent. of the total output for tool handles is shipped abroad, mainly to Germany, to South Africa, and to Australia.

The original supply of hickory is now approaching exhaustion. East of the Alleghenies and north of the Potomac it has disappeared almost entirely. West of the Alleghenies and north of the Ohio only a few scattered remnants are left, and the bulk of the supply lies south of the Ohio River. Most of the northern manufacturers get their supplies from the South; all of the larger operations are there and competition is very keen.

The cost for logging and lumbering hickory is greater than that for any other common native hardwood. It takes much time and trouble to locate and buy it because it can rarely be secured in large lots; because of the widely scattered supply the mill must be moved a great many times or the logs brought long distances; the wood is hard to cut and heavy to haul, and there is a great amount of waste at the mill—40 per cent. or more of the timber that reaches the mill. In addition, rough stock must always be shipped green, and that makes high freight bills. Altogether, it often costs twice as much to get hickory to the factory as it does oak.

Spoke billets are commonly rived. Rived billets are preferred by the spoke makers and bring the best prices, but riving is wasteful. Skilled hands may get as many rived spokes out of a given bolt as could be obtained by sawing, but fewer cuts are taken from the tree and the material which will not make spokes is never utilized, except occasionally for firewood. There is an additional waste because heartwood and birdpecked wood, which would be used if it were at the mill, is generally left in the woods. Much waste is avoided when the tree is cut into round bolts of the proper length and these are hauled or shipped to the mill to be sawed. A cord of hickory will yield about 700 rived spoke billets, or 900 sawed ones, or from 250 to 300 handle blanks.

The amount of merchantable hickory wasted each year may be conservatively estimated at 40 per cent. of the total cut. It consists both of waste in the woods and waste at the mill.

The greater waste is in the woods and is due chiefly to unnecessary restrictions against heartwood and birdpecked wood. Millions of feet of good hickory are cut each year and left in the woods because of the presence of a few birdpecks, or the large proportion of heartwood makes it unprofitable to market it. Such waste is especially great where spoke billets are rived out

A plantation of big shellbarks 27 years old. (The spacing was originally 4 by 4 feet, but the stand has been thinned)

A group of stump sprouts of pignut hickory

in the woods and only white billets are taken, because the red billets bring little more than half as much as the white. Another source of waste comes from the discrimination against the wood from the upper cuts of the tree in favor of that from the lower cuts. This is due not alone to the knottier character of the upper logs, but also to the prevalent opinion that the wood is considerably inferior to that from the lower cuts. The practice of cutting high stumps prevalent in the South is also very wasteful. It is claimed that the difficulty of sawing out with the grain makes it unprofitable to cut below the flare of the butt; therefore small trees are generally cut more than a foot above the ground and large trees more than 2 feet. Some firms, however, cut low stumps and consider that the greater width of the sap and the greater toughness of the wood in the butt are a sufficient offset to the difficulty of sawing. If the average stump height—at least 2 feet—were reduced only 8 inches, as would easily be possible, there would be saved as much as 10,000,000 board feet annually on the total cut.

A somewhat unavoidable waste arises from the taking out of special products, which leaves a lot of stuff in the woods which would make good handles or spokes, while the spoke or handle makers use up a great deal of material which should really be put into other products. Even where economy is attempted and spoke billets or handle blanks are cut in connection with poles, shafts, or rims, it is often difficult to dispose of the by-product, and it often happens that for lack of a market thousands of feet of hickory are destroyed by insects.

Much of the waste at the mill is due to the discrimination against the heartwood and birdpecked material. Another source is the practice of cutting spoke billets and rim and pole and shaft strips unnecessarily long. This is especially true of spoke billets, which are cut into a uniform length of 30 inches, whereas the spoke lengths range from 18 to 24 inches.

In addition to the waste of merchantable material, in lumbering much promising young growth is used for skids, is swamped out, and is broken by falling trees. This loss is hard to estimate, but it is very great, and will seriously affect the future supply.

To produce spoke and handle material, which takes more than half the annual cut of hickory, no method seems better than reproduction by sprouts. Sprouts grow faster than seedlings for the first fifty or sixty years, and produce heavier yields per acre; where sprout reproduction is at all successful it is less uncertain than seedling reproduction.

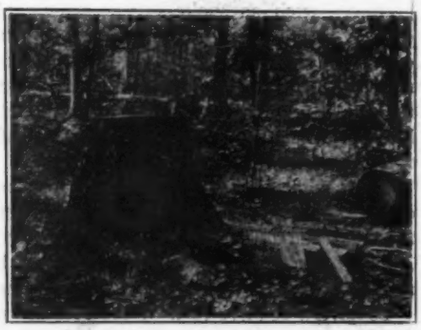
A simple clear-cutting for coppice growth, which can be used with oak and chestnut, will not, however, apply to hickories as they occur in mixed stands, because faster - growing species invariably outstrip and suppress the hickories so that they appear only on the edges or in the openings of such mixed stands. But there are many old fields and pastures, especially in the Ohio Valley, which are coming up to pure stands of hickory, and there the coppice method could be applied successfully. Since the sprouting capacity falls off very rapidly as the tree grows older, the cutting should begin as soon as the trees are large enough to use, which will be when they are from 8 to 9 inches in diameter and from 40 to 50 years old. The stand may then be cut clear.

Hickory sprouts coming up from the roots

Pure stands, however, are uncommon and it will often be advisable to plant hickory with the idea of ultimately managing it as a sprout forest. Because of the danger from squirrels and mice, Fall planting should not be attempted. The nuts should be kept over Winter between layers of sand and planted in the Spring, and since the long taproot makes transplanting impracticable, the nuts should be planted directly in the permanent site, and never in a nursery. The spacing should be about 5 by 5 feet, and two or perhaps three nuts should be placed in each spot about 2 inches under the surface, or it might be well to try a group mixture with a light-seeding species, such as white ash.

Care should be taken to plant only those species which are suited to the soil conditions. On exposed situations or on dry or sandy soils pignut is to be preferred, and even that demands a moderate amount of fertility to produce timber of good quality. On moist or wet soils big shellbark should be selected, and on fresh, fertile soils either shagbark or pignut. The latter furnishes the better grade of wood.

To secure the normally rapid growth essential to the production of strong wood, the stand should not be allowed to become overcrowded. Thinning should begin about the twenty-fifth year. The crooked or defective trees and those which are being crowded and have not room enough to grow should be removed. Eight or ten years later the thinning may be repeated. At the end of the next ten years, if the soil is fertile, it is barely possible that the stand may be ready to cut, but since seedling stands grow more slowly than sprout stands, it will usually be necessary to wait an additional ten years before cutting. In this case another ten-year thinning should be made, and by the fiftieth or sixtieth year the stand should be merchantable, and should then be cut and managed as a sprout forest.



Waste in hickory cut for spokes. (Showing the much too long stump and the workable material left in the woods)

Intelligent cutting can increase greatly the proportion of hickory in the forest and can improve the quality of the wood by hastening its growth. In such a forest the hickories finally should be cut when they have reached a diameter of about 12 inches. At this diameter, on moderately good soil, they will be increasing in volume at the rate of about 4 per cent. a year; at 14 inches the increase is about 3 per cent., and at 16 inches 2 1-2 per cent.

It will not be wise, however, to establish a hard and fast diameter limit, because the condition in which the stand is to be left must be taken into consideration. Smaller trees may be cut wherever there is promising young growth to take their places. If it is desired to increase still further the proportion of hickories in the stand, the trees should be left longer, and they must also be left longer where the other species are cut to a large diameter limit or where it is impossible to give the stand much attention.

Among the true hickories the common shagbark (*Hicoria ovata*), so called because of its peculiar bark, also known as "scalybark" and "shellbark," is the most widely known. The shagbark attains large size, and heights of from 130 to 140 feet, and diameters of from 20 to 30 inches are fairly common in the

Cumberland Mountains. In the river bottoms along the Mississippi the trees grow to larger diameters, but the maximum height growth is usually less. The southern shagbark (*Hicoria carolina septentrionalis*) is a recently distinguished species of little commercial importance.

Very similar in appearance to the common shagbark is the big shellbark, or king nut (*Hicoria laciniosa*). Lumbermen rarely differentiate between the two species, although they are quite distinct.

Of all the hickories none is more important than the pignut, and none offers more difficulties to the botanist. It is exceedingly variable and grows under widely differing conditions of soil and climate.

The mockernut (*Hicoria alba*) generally is smaller than either shagbark or pignut. The stem is less likely to be straight, and the branches are heavier.

In the forest the hickories are rarely predominant. Except through the interference of man, they do not grow in pure stands but always in mixture, somewhat group-wise, with other species, and especially with the oaks.

Salient points of the botanical distribution of hickory are the wide distribution of the true hickories, especially the pignut and the shagbark; and the centering of the distribution of nearly all the species in the lower Mississippi Valley, in western Tennessee, eastern Arkansas, and northwestern Mississippi.

Of all the species, shagbark and pignut are most widely and evenly distributed, and these two furnish the bulk of the hickory of commerce. Since most of the remaining virgin hickory is in the lower Mississippi valley, and since cutting is now especially heavy there, it is probable that most of the hickory on the market is shagbark.

The right way to raise hickory—A young stand of trees after the more mature growth has been cut

The commercial distribution of pignut corresponds closely to that of shagbark, except that it extends farther toward the coast in the Southeast.

Mockernut is characteristically a southern species. It is abundant in the lower Mississippi valley, but is commercially less important than shagbark.

Big shellbark has a narrow commercial distribution. It is most prominent in the region around the lower Ohio River, south along the Mississippi to central Arkansas, and northeast through the Wabash valley to northern Indiana and Ohio.

Dust Is a Meddler

Many New Automobiles Had to Be Refinished on Account of It

ONE of the makers of automobiles, during the dull season, had to store some 150 automobiles for several months. These cars were put in shape for shipping, and as the company thought, all that remained was to hunt up customers, which it proceeded to do. When things picked up again it was found that over half of all the finished cars were unacceptable to the agents on account of the state of the body finish; the storage room was dusty and the finish of the body work was soft when the cars were placed on storage.

The cost of the refinishing was not far from $50 per car, not counting the cost of the delay. The work of refinishing was done as follows:

(A) The bodies were removed from the automobiles and were placed in a light, well-ventilated room, protected from dust.

(B) The chassis were rolled into a separate light, well-ventilated room, protected from dust, and carefully gone over.

(C) The bodies were rested on "horses" and gone over to get rid of the free coat of dust.

Spoke bolts cut from pignut hickory. (This shows a close use of material; the stump is cut low and the tree utilized well into the leaf)

(D) With small bunches of waste saturated with turpentine the body surfaces were rubbed down to soften the outer skin of varnish.

(E) Strips of burlap were then used, rubbing vigorously, to remove the accumulation.

(F) By scraping, using a knife or a hook, accumulations that resisted the burlap rub-down were taken off.

(G) A second application of turpentine on waste was given to clean off all the remaining particles and any grease that might have been picked up.

(H) A burlap rub-down followed.

(I) In one or two bad cases, where the accumulations resisted removal, soft soap, with a dash of sal-soda was applied, using a coarse hair rubbing pad in the process.

(J) The next rub-down was with pumice stone flour to remove all the specks. This process also flattened down the surface.

(K) In all the cases that looked promising enough to "finish" with one coat of varnish, the old color was matched up, using enough rubbing varnish in the new match to cause it, when applied to the surface, to dry with enough gloss to counteract the light-absorbing properties of the color.

Judgment had to be used, especially in the bodies that showed "dead," and it was not possible to top off with one application of varnish.

Anti-Advertising

Which Does Not "Create a Favorable Impression on a Possible Customer"

IT would cost about $2 to remove it, and still it remains there for years, visible every day to thousands, or at least hundreds, of more or less impressionable observers. "It" is the large and conspicuous sign of a manufacturer's abandoned selling agency painted in gilt letters on a 30-foot expanse of a deserted building's dust-begrimed windows. It is an effective "anti-ad" against the automobile whose name it announces and couples undeservedly with relinquishment and decay. But it is only a type of many similar anti-ads which meet the eye in every large city. Perhaps a further consideration of the subject of anti-ads, in the form of unobliging clerks or poor stationery, could in many cases be added to the diversions of the advertising expert.

Reproduction of hickory in a field cut over four years ago and pastured severely by sheep, cattle and horses

Devoted to Electric Subjects

PROMINENT PART PLAYED BY ELECTRICITY IN AUTOMOBILE MANUFACTURING; CHART OF IGNITION BATTERY DISCHARGE; ELECTRIC AIR COMPRESSORS

ENORMOUS production in the gasoline automobile field has so attracted the attention of those who have the time to eye-measure the automobile art that they fail to penetrate to the bottom of the situation, and their dreams are of gasoline, and nothing else. Let us have a look at the real situation, and observe what an enormous part is played by electricity, using vast quantities of electrical equipment, in the form of dynamos, motors, and accessories for lighting and power purposes in the plants, and this is all beside the question of electric vehicles and the position they occupy in the art. It is variously estimated that upwards of 270,000 horsepower in electric motors is used in the propelling of machine tools utilized in the building of automobiles.

The power required for these electric motors demands the use of dynamo electric machines of a combined capacity of 67,000 kilowatts, or 90,000 horsepower. The steam engines of the various plants aggregate a delivery of 125,000 horsepower on an average basis as they are employed in the driving of the dynamo electric machines that furnish current for power purposes to the electric motors in the plant, and this takes no account whatever of the lighting requirement.

The blight that has been feeding upon the electric vehicle for years is being eliminated; quality, bereft of an entangling alliance, is forging ahead, and, as in every other art, a contract with Satan is not binding, nor is it advantageous. Just how Satan has kept electric vehicles out of the running is a matter that will not have to be discussed; there is no use of going back into the smoke after emerging, but the future prospect of the electric is too much of a good thing to be entirely ignored, and those who have ever expressed a preference for electric vehicles are now enjoying the situation.

Ignition Battery Discharge

Chart of the Discharge of an Ignition Battery

LEAD-LEAD storage batteries are much used as the source of electrical energy in ignition work, and while it is not possible to present a curve of discharge at a constant rate, for a long period of time, the curve as here offered was over a duration of 55 hours as plotted in the ordinates, and abscissa show voltage, there being three cells in the battery, so that the maximum voltage when the battery was fully charged was 6.6. The discharge was regulated by one 16-candlepower incandescent lamp in circuit, fixing the rate of discharge at about 55 watts. The discharge ran along at a constant rate for 25 hours, and then tapered off to 5.4 volts at the expiration of 45 hours, which represented the end of the safe discharge. The next 10 hours brought the battery down to 2.5 volts, which of course induced a condition of excess sulphation, tending to deteriorate the battery. From the automobilist's point of view, the danger of destroying the battery comes with his lack of knowledge of the state of the discharge or of a means, ready to hand, for determining when the battery should be recharged.

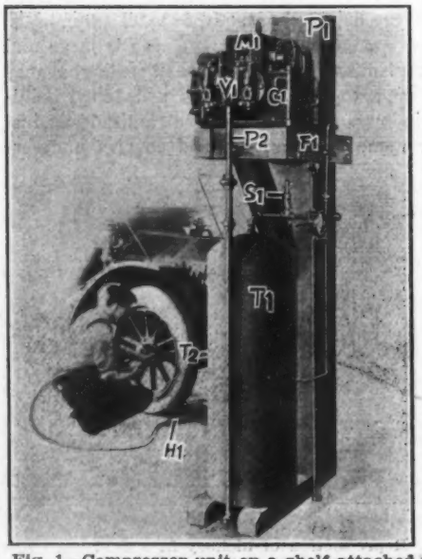
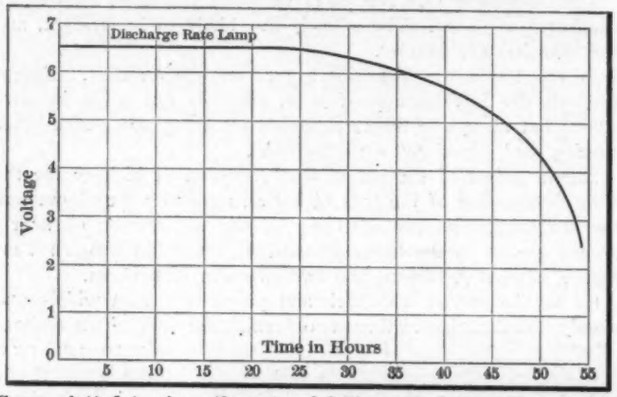


Fig. 1—Compressor unit on a shelf attached to a post with air tank on floor



Curve plotted to show the rate of falling off of the voltage in the course of time

Motor-Driven Air Compressors

Portable Electrically Driven Air Compressors

TIRE life depends absolutely upon the state of inflation, and the latter, in turn, is rarely ever up to the point where safety resides. A staff representative of THE AUTOMOBILE made it his business to examine a considerable number of tires just as they were required to serve, taking the pressures on the street and as the cars were rolled out of garages, invariably obtaining from the chauffeurs their version of the actual pressure obtaining in each case. As an example, one car with 36 x 5 1-2-inch tires registered a pressure of 70 pounds, and the chauffeur said that the pressure was 110 pounds. He was so positive about it that he questioned the accuracy of the 70-pound pressure measurement,

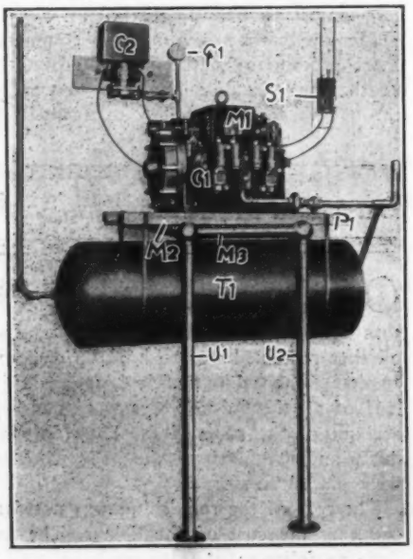


Fig. 2—Compressor unit on a tubular structure with the air tank swung beneath

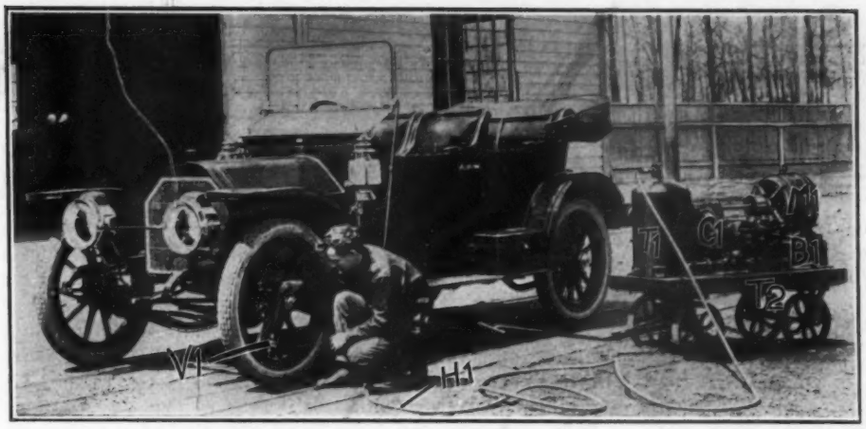


Fig. 3—Compressor unit on a truck for portable work with a long hose connection

putting his gauge on instead of that of the staff man, only to find that the pressure was inside of 75 pounds, but slightly over 70, according to his gauge. In another case, where the chauffeur said he was running pneumatics on a pressure of 80 pounds, the gauge showed that he had 30. In no case whatever, where reliance had been placed upon ordinary tire pumps, was the pressure found to be more than half of what it should be.

Quite a number of garages are fitted out with air compressor units, and in many cases the owners of automobiles use inflating tanks, or some form of power pump that permits of inflating the tires up to the desired point without manual labor. In nearly all of these examples tire pressures have been found up to standard. The inference to be drawn is that the best way to conserve tires is to provide a power method of inflating them, and in a garage there is nothing more efficacious by way of equipment than an electrically-driven air compressor, and a suitable tank as shown in Fig. 1, in which the compressor C1 is driven by an electric motor M1, comprising a unit, resting on a frame F1, the latter being fastened to a post P1. Air is delivered by a pipe P2 to a tank T1, connected with a gauge G1, with a safety valve S1, not forgetting, however, that the motor is started and stopped automatically, and that the pressure is ordinarily maintained at the desired point, through the good office of automatic valves V1, attached to the compressor C1. The air pressure is piped to various convenient points, and tapped off by means of flexible metallic hose H1 for use in the tires T2.

Another and neat installation of this type of compressor is shown in Fig. 2, where the compressor C1 is driven by its motor M1, delivering air into the tank T1, which is fastened to the platform P1 and control is maintained by means of the automatic device C2 with a pressure gauge G1 to show the amount of pressure carried in the tank. The platform P1 is carried on a tubular structure with uprights U1 and U2 resting on the floor with heading members M2 and M3 as shown, the remaining heading member not being shown. The tubular structure is built up of the character of tubes and fittings in common use in railing work. When it is desired to start the motor, the switch S1 is closed, and the automatic starter takes care of the motor thereafter.

Still another application of the electric compressor unit idea is shown in Fig. 3. In this case the motor M1 is mounted on a bed plate B1, driving the compressor C1 which puts air in the tank T1 and the pressure is taken away by the hose H1 for use in the tires in the regular way. A quick acting valve V1 serves as a convenience in attaching the hose to the tire. The compressor and its driving unit together with the tank are placed on a truck T2, and by means of electric cables, together with wall attachments at convenient points, aided by the use of a long pressure hose, it is feasible to roll the compressor unit to the various points of vantage, connecting up the electrical current as the occasion requires, and utilizing the long pressure hose to some extent. This unit is very compact and convenient.

Fig. 4 shows the compressor unit as manufactured by the Allis-Chalmers Co., of Milwaukee, Wis., with the compressor head H1 bolted to the base-casting C1, by means of holding bolts H2, of which there are 10. The valves V1, V2, V3 and V4 are in an accessible position, and power is delivered to the compressor by means of a single reduction square cut gear within an oiltight housing H3. The motor M1 is of the consequent-pole type with liberal main bearings B1 and B2 of the sleeve type, provided with ring oilers in the customary way. The commutator C2 is of large diameter, and the armature is cross-connected, thus reducing the brushes to one set, B3 and B4. The motor is furnished for any of the desired voltages, but in ordering, it is necessary to state the voltage of the circuit to which the unit is to be attached, also whether or not it is direct or alternating current.

Electric Market Active

Widespread Charging Facilities and Low Cost of Energy Popularizing the Type

ACTIVITY in electric vehicle work is the most noticeable feature of the present market. A better understanding of the utility of this type of car, accompanying a more healthy state of the battery situation, coupled with a brisk demand for electric commercial cars, all tend to the betterment of the whole situation, but it must also be remembered that large financial interests are now in a better state of mind about all automobile activities. It was but a short few months ago when financial houses were scared half out of their wits for fear all the money in the world would migrate to the coffers of makers of automobiles; they overlooked the fact that very few men indulge in "white elephants," and to the man who has no use for an automobile it is a white elephant with a vengeance.

There are other influences that the public at large will only learn of in time; it is now possible to obtain a "charge" for a battery in almost every hamlet from Maine to California. What is equally to the point, the cost of electrical energy is relatively low; it compares very favorably with gasoline at $32 per ton.

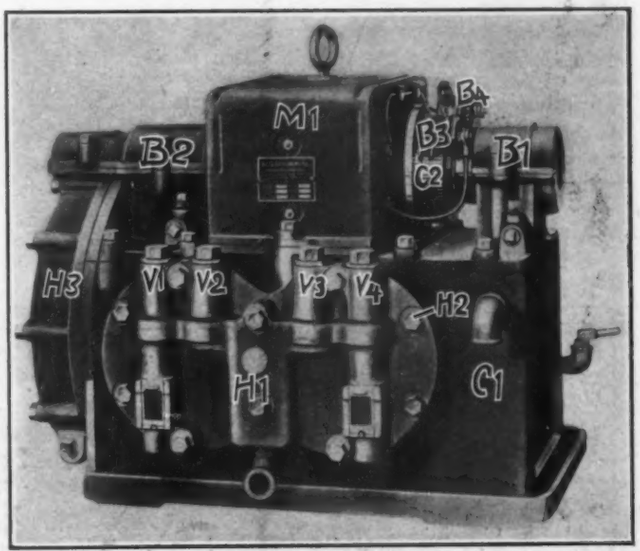


Fig. 4—Air compressor unit with the consequent-pole motor bolted to the base, with a single-reduction square cut-gear drive

Operation and Care

DESIGNING FOR NOISELESS PERFORMANCE; KEEPING NOISE OUT; COST OF A TOUR; CANTOR LECTURES; CARBURETER ACTION; PRACTICAL REPAIRING, AND A SERIES OF SHORT ARTICLES

WHEN an automobile is placed in the hands of the user, his main concern lies in utilizing it for the intended service, and the more he can get out of it, the greater will be the return on his investment. There are two principles involved in the operation of a machine. In English locomotive practice, as it obtains on railways there, the locomotives are so designed that they may be readily repaired, and the operating engineers make it a point to use them sparingly, laying them up for repairs, or adjustment, on the slightest provocation, the idea being to husband the machines, with the intention of putting into them as much by way of upkeep as is taken out of them by service. According to this plan, a locomotive is intended to last until progress puts it in the classification of the obsolete. In American railway practice the exact reverse holds. A new locomotive is put into service and it is run to death. It is the claim of the American railway engineer that the value to be kept track of is the number of ton miles that a locomotive pulls in the shortest possible space of time. It is recognized that when the machine is new, with its superabundance of sweet-running qualities, it will do the most work, and that, too, without putting money into it on a repair basis. There is one other advantage to be ascribed to this plan. All the good that resides in the new machine is abstracted from it before it becomes obsolete.

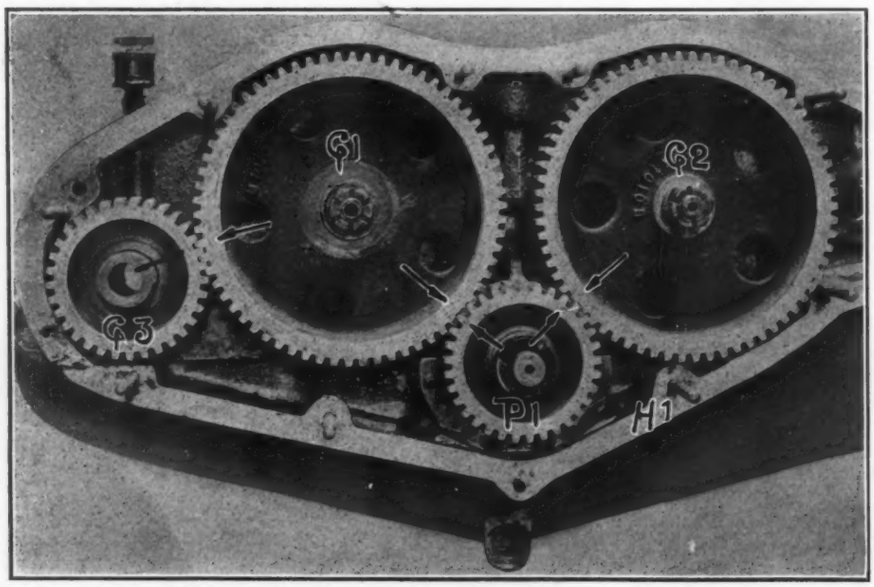
The only difference there is between a railway locomotive and an automobile, from an abstract point of view, lies in the fact that the locomotive has a "permanent way" with steel rails to roll on, and it serves under "factor" conditions. The automobile is excused from doing factor work, but it labors under the disadvantage of having to go in response to the will of the operator over such roads as indifference provides.

It remains, under the circumstances, for the owner of a car to choose the English method if he thinks that his automobile will not become obsolete by virtue of the production of a better one within a year or two after he makes his purchase, or he can pin his faith to the American idea, disregarding the future, getting all the service that the automobile will deliver, with the expectation that it will last long enough to pay for itself, leaving him in a position to take advantage of a new market at the propitious time.

Perhaps a happy medium offers some attraction, in which event the purchaser of an automobile must become familiar with the mechanism and learn how to fix it if the occasion requires. Under such conditions it is believed that the first thing to know is how to time the valves, and remembering that the camshaft runs at half the speed of the crankshaft in a 4-cycle motor, it remains to examine the gear system which actuates the camshafts, and observe (see illustration) that the pinion P1, on the end of the crankshaft, is provided with half as many teeth as the gears G1 and G2 on the ends of the camshafts. The gear G3 is placed to drive the magneto, and in this example it has the same number of teeth as the pinion P1, making the magneto rotor rotate at the speed of the crankshaft. When the cover is removed, exposing these gears, the first thing to observe is that the gears are marked, if the automobile is well made; but if it is, by some chance, the product of an indifferent plant, they must be marked. In the illustration the gears are marked in such a way that the space 3 of the pinion P1 accommodates the tooth 3 of the gear G2, and the tooth 2 of the pinion P1 meshes with the space 2 of the gear G1, whereas the tooth 1 of the gear G1 meshes with the space 1 of the gear G3. In disassembling the gears, unless they are properly marked, it may take one unfamiliar with the situation several days to reassemble them, whereas by observing the markings it becomes a mere matter of putting them together, taking, perhaps, five minutes. This illustration shows the virtue of first deciding what to do and then doing it systematically, but in the absence of system it is recommended that the automobilist adopt and stick to the American practice as it obtains in railway work, *i. e.*, run the car until it becomes unruly, and then scrap it.

But this plan should be carried out with some intelligence, and the mileage obtainable under sweet-running conditions will be a maximum if the automobile is "groomed" on occasions; nor is there any good ground for assuming that the degree of neglect allowable should exceed the amount that other means for transportation will thrive upon. It is not uncommon to see automobilists struggling with well-made cars, looking here and there for troubles they cannot find, destroying the good adjustment that bespeaks harmony of the relating members, when, in all seriousness, the cleaning of the spark plugs would overcome the whole difficulty, revamping more or less a $3,000 investment at the cost of a little labor.

But if the trouble is not quite so close to the surface it may be in the shape of a few globules of water clustered around the orifice of the nozzle in the carbureter, or a little leak in the intake manifold between the carbureter and the combustion chamber, if not due to a valve shutting off the flow of gasoline from the tank to the carbureter, although an empty gasoline tank gets in the way of success every once in a while.



HALF-TIME GEAR SYSTEM OF A TWO-CAMSHAFT MOTOR, SHOWING METHOD OF MARKING FOR FUTURE REFERENCE

Care and Repair of Tires

DEALING WITH THE QUESTION OF WEAR AND SUPERFICIAL AREA OF CONTACT AND LARGE REPAIRS TO CASINGS THAT APPEAR GOOD TO THE NAKED EYE

THE average autoist does not really go into the question of tire upkeep with any degree of thought. What principally interests him is that tires cost so much; when will there be a reduction in price, when will they invent something that will do away with his *bête noir*, "puncturable tires"? It is with the idea of calling his attention to some of the causes of tire wear that this article has been prepared.

It is fair to assume that if friction is applied to two surfaces with a certain pressure the one with the larger area will wear out sooner than the other, and if the pressure is increased (which may be represented by the increased speed of the car), the wear on the larger will take place faster still than on the smaller area.

Fig. 1 shows the length of the tread of a 34-inch x 4-inch tire fitted to the rear wheel of a five-passenger car unloaded, and it will be seen that the amount of tangential contact increases twofold as the tire is underinflated, thereby offering double the amount of tire surface for frictional wear to the ground.

These figures were obtained by lifting the car from the ground by means of a jack and allowing an imprint to be taken of tangential contact without taking into consideration how much a tire will further deflect when driving strain and torque are added. The area in square inches more clearly illustrates the surface presented to the ground as the following table shows:

Pounds per Square Inch	Area of Contact in Square Inches of a 34x4 Tire
80	4.94
70	5.87
60	6.88
50	9.01
40	11.2
30	13.62
20	15.06
10	16.32

Fig. 2 shows the amount of slip that takes place when the steering wheel is moved while the car is traveling, and here we get two distinct actions: first, the rolling action under pressure due to the superimposed weight, and, second, the side friction caused by the necessities of steering. This impression was taken with the tire inflated to 80 pounds and represents a surface slide; but the moment the tire is deflated there is added a pulling at the side walls which tends to weaken them, and in some cases tears them off the rims if a curve is taken too fast. This can be clearly seen in Fig. 3; the top point of contact shows signs of twisting strain in the way it tore the paper, and this means the infliction of a small bruise which has the effect of tearing at the strands of canvas that form the lining of the tire. Repeated bruises similar to this may cause a weakness in the canvas and affect the adhesion of the rubber to it. A small hole caused by a nail or sharp stone at this part starts the trouble and ends in a blowout, as moisture can creep through the bruised canvas, and thus, like a disease, infect a large area around the small initial hole. It is surprising to some autoists that, when they send their tires to the shop for the remedying of what looks to be a two-inch repair, they should be called upon to pay for anything from a 6- to 16-inch insert. The cause is that when the section to be repaired is ripped away the canvas at either side of the section is found to have parted company with the strip to which it was once vulcanized. The repairer is then compelled to cut and rip away till he finds the layers have a firm anchorage. It is about as much use repairing on a bad foundation of canvas as to try to stick a patch on an inner tube that has not first been cleaned off with gasoline or sandpaper. Repairers should pay particular attention to this, and rather than do a job that would not last, endeavoring to vulcanize rubber on a bad foundation, it is better to tell the owner the facts of the case. If a tire is repaired in this condition it will not last any length of time, and this accounts in the majority of instances for retreaded tires giving way almost immediately after they are put on.

Fig. 2—Slip caused by slight side action of front tire due to steering

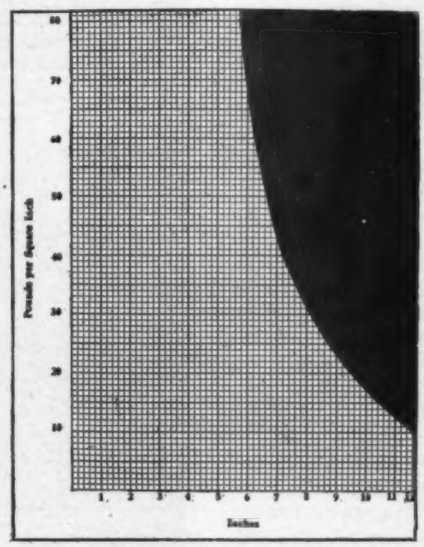


Fig. 1—Length of contact of a 34 by 4 tire at different pressures

Fig. 3—Twisting effect of underinflated tire due to pivoting front wheel

The Cost C

Cooling The Engine

Near Utica

Along the Erie Canal

INEXPERIENCED automobilists when they first acquire a car permit their ambition to run away with their good judgment. Starting out on a long tour is easy enough for them, but unless their funds in hand far exceed the judgment they display, they fail to enjoy the situations that they originally considered paramount, and are mostly concerned about how they can get home with gasoline, lubricating oil, tire bills, and hotel expenses to pay.

Unfortunately, those who have acquired this character of experience, fail to keep an accurate account of their expenditures, or decline to publish the accounts. The cost of touring, considering the advantages, is really not great, but the trouble encountered is due to the fact that inexperienced automobilists labor under the impression that all they have to do is to steer the automobile and look at the scenery.

The particular tour of which an account is here given of the cost, took departure from Freehold, N. J. (en route to Billings, Mont.), on Tuesday, June 22, 1909, and, as the author of this article states: "Followed very excellent and familiar roads to New York City, via Perth Amboy, and Staten Island."

The owner's log of the trip continues on as follows:

There were several reasons for our undertaking this trip. One was that a rather enjoyable and certainly very instructive vacation would be spent. Another, the desire to see a member of the family who resides in the vicinity of Billings. Another the complete novelty to us of the whole thing and the anticipated pleasure of "burning up" the prairie in an automobile. At the outset, we did not exactly expect to cover the entire distance, yet we had so much confidence in our car and chauffeur that, through our ignorance, we were quite hopeful.

One mistake was made in taking along too great a supply of rugs, coats, sweaters, etc., half of which were never used. The tonneau was littered to such an extent that we had difficulty to get in and out. Then we attempted to carry, on the rear, more trunks and valises than were good for the car. At Erie, Pa., we thought it best to express some of these to Chicago.

)f A Tour

Luncheon Near Lima

Mohawk River

An Old Covert Bridge in Ohio

At no stage of the tour did we attempt to hurry.

We left Freehold on Tuesday, June 22, 1909, following very excellent and familiar roads to New York City, via Perth Amboy and Staten Island. We had lunch here and about 3 o'clock went up Broadway and followed the Albany Post Road to Tarrytown. This road was very poor. Here we missed our route, taking a back way to Briarcliff, where we spent the night. 80 miles.

June 23. Left Briarcliff late in the forenoon, taking the Post Road again. As far as Fishkill it was the same. From there to Albany it was very good. At Poughkeepsie we had lunch and purchased a Blue Book of N. Y. State, a very necessary item. A few miles outside of that place the shock absorbers in the rear, which had not been put on correctly, were smashed by the bumps and had to be taken off. Kept on the East Side of the river to Albany, where we arrived at 8 o'clock. 132 miles.

June 24. Remained in Albany in the morning to see the Capitol and some historic houses and churches. About noon we took the road to Schenectady and on from there through Amsterdam, where we had lunch, and Herkimer and Utica. To within 15 miles of the latter town the road was rough and generally bad, beyond that excellent. The Mohawk valley was beautiful and we followed the banks of the river for a great many miles. 95 miles.

June 25. Went on through Syracuse to Auburn. Excepting for a few miles the road was fine macadam. Had the first tire trouble this day. Arrived in Auburn in time for lunch and decided to spend the night there, as the hotel was very good. 78 miles.

June 26. Got an early start and went through the Montezuma swamps and Seneca Falls to Geneva. We were very much impressed by this beautiful old town with its colonial houses. Went on from there past Canandaigua Lake and Lima, where we had lunch, to Buffalo. Had two punctures. Excellent road almost all the way. 141 miles.

June 27. Remained in Buffalo to rest and "take in" the sights.

June 28. Good road to Erie, Pa. Went through Fredonia to Westfield in the midst of the Chautauqua County grape section. Had our lunch here and took a look around until 5 o'clock. Expressed surplus baggage to Chicago. One puncture. 95 miles.

June 29. Beautiful road to Cleveland, Ohio. Passed Conneaut over a great viaduct leading into Ashtabula and through Cleveland on the famous Euclid avenue. Here we missed the good road to Sandusky, Ohio, and took a terrible back way covered with deep ruts. Made poor time, but finally reached Norwalk, Ohio, where we spent the night. 160 miles.

June 30. Poor road to Bryan, Ohio. Went to Toledo for lunch and on across the Maumee River and through Archbold to Bryan. The country was beautiful, but did not impress us especially. Were disgusted with the roads. We had a little trouble with the chains, which were loose and kept coming off. 125 miles.

July 1. Fair roads to South Bend, Ind., but fine from there to Chicago. Went through Waterloo to Kimbelville, where we lost our way completely and had a terrible time as far as Rome, Ind. Spent the afternoon in South Bend, going on in the evening to Chicago without a stop. Just outside of Chicago we lost our way again in a maze of roads and railroad tracks. 216 miles.

The distance from Freehold, N. J., to Chicago by our route was 1,122 miles. We used 154 gallons of gasoline. Average, 7 1-4 miles to a gallon.

Cantor Lectures on Motors

PROFESSOR W. WATSON, D.SC., F.R.S., DELIVERED A SERIES OF LECTURES ON THE GASOLINE MOTOR, OF WHICH THIS IS THE FIFTH INSTALLMENT—BY PERMISSION OF THE ROYAL SOCIETY OF ARTS

IT is found that in a mixture of gases which are capable of rapidly combining together when heated sufficiently at one point, the combination or combustion may take place in two entirely distinct manners. In the first of these, called inflammation, the combustion spreads out from the point at which it is started, each portion of gas, as it burns, heating the neighboring portion till its temperature is sufficiently raised so that it itself burns, and so on throughout the mass. This method is quite slow, but is the one with which we are primarily interested.

The other method of combustion is called detonation, and appears to be caused when a wave of compression is set up in the gas, so that the heat developed by the compression is sufficient to fire the mixture. In this case the combustion is spread as fast as the wave of compression travels through the gas, that is, at an enormously greater speed than is the case in inflammation. Thus, when a mixture of carbon monoxide and oxygen is lighted in a tube about a foot long, the progress of the flame can quite easily be followed by the eye, the speed at which the flame travels being about 4.7 feet per second. If, however, I start a compression wave in some of the same mixture contained in a lead pipe, about 20 feet long, by firing a small quantity of electrolytic gas at the end, you will notice that the explosion appears to take place throughout the whole length of the tube, and a length of glass tube at the far end is shattered, at the instant at which I depress the key which causes the passage of the firing spark. The detonation wave is not, of course, quite instantaneous in its passage, but since it will travel 5,500 feet in a second, the time taken to traverse 20 feet is quite inappreciable. The noise produced in the case of the detonation, and the shattering of the glass tube into a fine powder, will suggest to you that detonation, if set up in an engine cylinder, might cause great damage. Luckily the nitrogen, which forms about 79 per cent. of atmospheric air, acts as a preventive, as far as the detonation of air-petrol mixtures is concerned. If, however, pure oxygen is employed, or if such a gas as acetylene is used, then this question of the production of detonation will become of importance. That pressure waves, such as are required to initiate detonation, do, under certain conditions, exist in the cylinder is shown in Fig. 18. In the case of the charge fired by a spark in the exhaust valve-pocket, pressure-waves having an amplitude of as much as 100 pounds to the square inch actually existed when that particular diagram was taken.

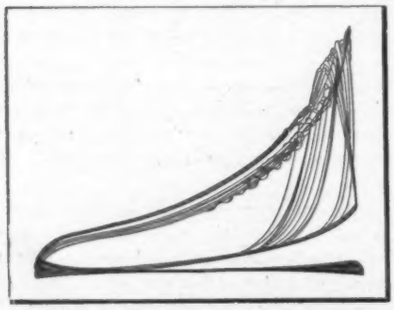


Fig. 20—Manograph card showing earlier and earlier ignition on compression stroke

Returning to the combustion of air-petrol mixtures, it is found that the richest mixture which will burn contains about 1 lb. of petrol to 7 lbs. of air, while the weakest contains about 1 lb. of petrol to 26 lbs. of air. In the case of the lower limit (weak mixtures), a very small reduction in the proportion of petrol is sufficient to pass from the inflammable to the non-inflammable conditions. In an engine where the fresh mixture is always mixed with a certain amount of the products of combustion left over from the preceding stroke the lower limit is about 20 of air to 1 of petrol, but satisfactory working will only be obtained with mixtures containing less than 17.5 of air to one of petrol. For mixtures between 17.5 and 20 of air to one of petrol, there is liable to be popping in the carbureter. This is because these very weak mixtures burn so slowly that the charge is still actually burning even at the end of the exhaust stroke, and hence the incoming charge catches fire, the combustion spreading through the induction pipe to the carbureter.

Although I am not aware that any direct experiments have been made on the temperature to which a mixture of air and petrol must be heated before combustion starts, from the values obtained in the case of other hydro-carbons (methane 700 deg. C., ethane 575 deg., etc.), it is probable that at a temperature somewhere between 600 deg. C. and 700 deg. C. petrol-air mixtures will inflame. This fact limits the amount of compression which can be used in a petrol-engine, for the charge, being compressed practically adiabatically (*i.e.*, without loss of heat), if the compression is carried too far, will fire before the end of the compression stroke, causing the phenomenon called pre-ignition. That one can easily fixe a mixture of petrol and air by compression I can show by an experiment. I have a glass tube closed at one end and fitted with a piston. I drop a small piece of cotton wool soaked in petrol down the tube and rapidly depress the piston, when the petrol vapor burns, causing a bright flash.

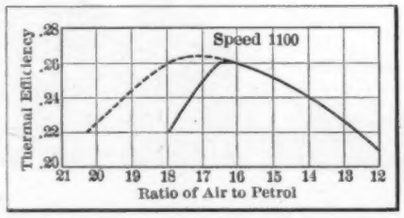


Fig. 23—Chart showing gain in economy by advancing spark when using weak mixtures

Pre-ignition may be started in an engine in which the compression is not great enough to cause the temperature of the

mass of the charge to reach the ignition point, if some solid body, such as a projecting wire or piece of carbon, gets sufficiently hot. In such a case the gas in the immediate neighborhood of the hot body starts at a fairly high temperature, and the increase in its temperature, when compressed, may be sufficient to cause ignition. By placing a platinum wire in the combustion space of the engine used to illustrate these lectures, and then gradually heating this wire by the passage of an electric current, we can cause pre-ignition to occur, and you can follow the phenomenon by means of the indicator diagram thrown on the screen. Pre-ignition, once started, rapidly gets earlier and earlier, because when a gas is fired in a closed space the portion of the gas first fired, and which is compressed by the rise of pressure produced as the rest of the charge is fired, reaches a much higher temperature than that reached by the portions which ignite last. Hence, when pre-ignition starts at the wire, the great heat there developed raises the temperature of the wire very rapidly, so that ignition takes place earlier and earlier on the compression stroke, as is shown very clearly in Fig. 20.

The speed at which inflammation travels through mixtures of air and petrol of different strengths has been examined by Dr. K. Neumann, of Dresden, and some of his results are plotted in Fig. 21. It will be observed that the maximum speed is only 7.5 feet per second. This corresponds to a mixture containing 12.5 parts of air to one of petrol; for both richer and weaker mixtures the speed decreases rapidly, so that for those near either limit the speed is less than one foot per second.

The fact that the speed varies with the strength of mixture can be easily shown by experiment. Thus I have a glass tube filled with a weak mixture of petrol vapor and air, and firing this at one end, it will be seen that the flame travels quite slowly down the tube. On refilling the tube with a stronger mixture and repeating the experiment, the flame is seen to travel much more rapidly.

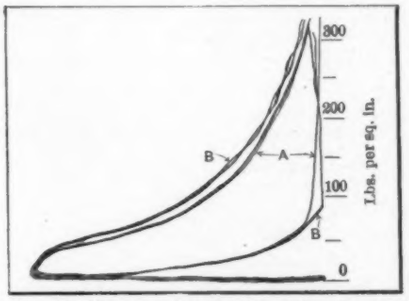


Fig. 24—Manograph showing advantage of advancing spark as speed increases

The slowness with which flame travels through a mixture of petrol and air can also be shown by the following experiment: Such a mixture is caused to escape through a narrow glass jet, the pressure being variable. When the pressure is low, so that the velocity of the escaping mixture is small, the flame, on lighting the gas, remains at the top of the jet. If, however, the pressure is increased, the velocity of the gas is such that near the jet, where the velocity is a maximum, the flame does not travel down as fast as the gas moves up. Hence the flame rises up from the jet and can be kept stationary at two or three inches above the end of the jet. The point at which the flame becomes stationary is that at which the upward velocity of the mixture of air and petrol is exactly equal to the downward velocity of the flame propagation. The question of the velocity of flame propagation is one of considerable importance, particularly in the case of high-speed engines. Thus in the case of an engine having a speed of 3,000 revolutions per minute the whole of the working stroke only occupies 0.01 second. Now, if the combustion of the charge, in place of being complete soon after the top of the stroke, is delayed till the piston has completed a fifth of its stroke, a very marked decrease in the mean effective pressure is observed, so that the instant of attainment of complete combustion must be adjusted to within two thousandths of a second in the case of an engine working at 3,000 revolutions per minute. Further, since the speed with which the flame spreads through the mixture varies with the strength of the mixture, what is a correct spark advance for, say, a strong mixture, will not be

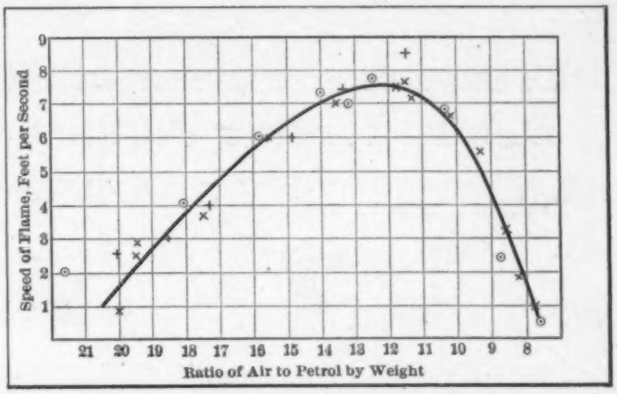


Fig. 21—Chart showing speed at which flame passes through mixtures of air and gasoline of different strengths

enough for a weak and hence more slowly burning mixture. This effect is illustrated in Fig. 22. In the left-hand diagram we have the spark timing adjusted as suited to a fairly strong mixture, and, as a result, the maximum pressure is not reached, that is, the charge is not completely inflamed, till about a quarter of the stroke is completed; the indicated horsepower being 2.36. If, however, the spark is advanced considerably more than would be advisable with a strong mixture, it is possible to obtain complete inflammation near the top of the stroke, as is shown in the right-hand diagram, and, as a result, the indicated horsepower rises to 2.76, an improvement of 17 per cent. The gain in economy by being able to advance the spark more than usual when using weak mixtures—and it is only with such weak mixtures that economical working is obtained—is shown by Fig. 23. The curve shows the efficiency obtainable with different strengths of mixture, obtainable in the case of a certain engine. The full line curve shows the conditions when the spark advance is kept throughout as it would be with the stronger mixtures, while the dotted curve shows the improvement obtainable by suitably advancing the spark.

Not only is the power of adjusting the timing of the spark of advantage to counteract the change in the velocity of flame propagation, with change in the strength of mixture, but it also allows us to secure the best results at different speeds. It is evident—since the distance the flame has to travel remains the same at all speeds, while, if the timing of the spark is fixed, the time between the passage of the spark and the top of the stroke decreases as the speed of the engine increases—that if the timing is right at slow speeds, then as the speed increases the spark advance will not be great enough, and *vice versa*. This effect is shown in Fig. 24. The diagrams shown were obtained at a speed of 640 revolutions per minute, the spark advance in the case of the diagram marked A being such as to give the best results at a speed of 1,600 revolutions per minute. The diagram marked B is that obtained when the spark advance is reduced to the best value for the speed of 640 revolutions per minute. The indicated horsepower corresponding to A is 2.9, while that corresponding to B is 3.3, a difference of 14 per cent.

It would thus appear that with an engine fitted with a fixed ignition, neither with varying strengths of mixture nor with varying engine speeds can as good results be obtained as if we are able to adjust the spark advance to suit the conditions.

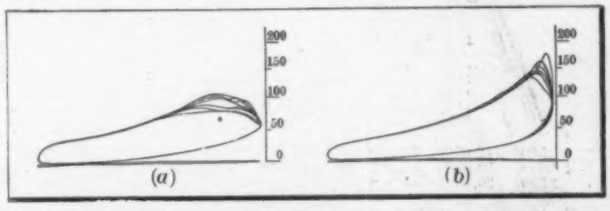


Fig. 22—Manograph cards showing how horsepower is increased by advancing spark

Don'ts for the Autoist

WHAT NOT TO DO ABOUT REPAIRING AN AUTOMOBILE. HOW NOT TO DRIVE ON THE ROAD AND A FEW OTHER INJUNCTIONS

Don't linger on the brink of a bad repair job; if the repairman is a bungler "can" him.

Don't undertake to run a repair shop without competent help; it is extremely difficult to conceal the shells.

Don't forget to look after the insurance policy of your automobile just before you send it to a repair shop; places like that do burn down.

Don't run a repair shop without having everything properly insured; you may have to fix the place up a little before the insurance people will take the risk; why not do so?

Don't try to bribe the inspector from the building department in order that you will be able to evade some of the rules that are promulgated for safety; why not put your money into the building instead of trying to make a crook?

Don't handle gasoline in the garage just as if it were a fire extinguisher; the regulations for the safe handling of this liquid are fairly good—it is cheaper to follow them.

Don't roll your car out of the garage at a racing speed; you might run over your nearest relative, or the man who is on his way to make you his heir.

Don't smoke cigarettes, but if you must hasten the time, why endanger other people by lighting them in a garage, or near a can of gasoline?

Don't clean the garage floor if you have money in the tire business; the way to increase the demand for tires is to soak them in lubricating oil.

Don't attend to your own affairs if you want to have them mismanaged—just leave it to your help to do things wrong.

Don't take advantage of progress; be a back number; that is, if you want a large tire bill to pay; old style clincher rims are at a premium on inactivity, and so the cost goes up.

Don't ask a "native" for directions to the place to which you want to go; natives are notoriously inaccurate—equip yourself with "canned" directions in the form of a reliable guide book.

Don't ramble; it is more enjoyable to map out an itinerary; be sure and include some historical place that will make it an object to travel; something to look forward to.

Don't map out too long a journey per day; there is little enjoyment in a ride of more than 100 miles in 10 hours.

Don't fall in with speed maniacs; let them pass on; you are not bound for the same place.

Don't take any man's dust; all that you have to do to avoid it is to allow him to speed on. True, you will be left in the lurch; it is a rather nice place; beats a hospital.

Don't map out a belated schedule; it will make you work. Touring is work, unless it includes leisure of thought and action.

Don't neglect the advantage that comes from a good average speed in the absence of spurting; all damage is done at the higher speeds.

Don't overlook the story that insurance statistics tell; high-speed automobiles have proven to be inferior insurance risks.

Don't forget that a poorly made automobile will outlast a high-priced creation if the latter is driven at a high speed all the time.

Don't ask the maker to fix your car up with a gear ratio that will permit you to travel like the dickens on a level; the car will then go like a snail up a hill.

Don't forget that good average speed is superior to good level road performing; miles per day should be considered rather than miles per minute.

Don't overlook the advantage of a speedometer of some kind; buy a good one; resolve never to tax it above a certain reasonable speed.

Don't be so short-sighted as to travel by the speedometer to the extent of going by it irrespective of the road condition.

Don't go 20 miles per hour on a road that is only fit for 10 miles per hour.

Don't go as fast at night as you do in the day time, even if the lighting facilities are good.

Don't let the chauffeur drive a foot after he quenches his thirst.

Don't have a thirst of your own if you have to drive an automobile.

Don't entertain any exception to this rule; accidents are invariably urchins of exceptions.

Don't put a tooth in letting the chauffeur know where to jump off if he has a thirst.

Don't assume that there are no temperate chauffeurs; all the good ones are positively temperate.

Don't expect the chauffeur to be without any habits at all; some of them smoke; others may smoke hereafter; choose the one who smokes here.

Don't discover a good chauffeur and then hold him down to poor pay; cut diamonds are worth money.

Don't forget that a good chauffeur can save you a round thousand dollars per year in cost of maintenance—give him a share of the saving.

Don't be blind to the cost to you of a poor chauffeur; he may stretch your purse to the extent of an extra thousand per year; give him half the profit.

Aluminum Alloys

Some Actual Tests of Cast Aluminum Used for Crankcases

ALUMINUM as used in crankcases and transmission gear boxes differs in strength over a wide range, depending upon the composition of the same, whether or not new metal is used in testing and if scrap is put in the charge the purity of the latter must be taken into account. It rarely ever happens that good aluminum castings result from the use of even a small amount of scrap, due to the presence of Babbitt metal, the contents of which has a marked influence upon the performance of the aluminum. Since Babbitt bearings are employed in motors and elsewhere in automobile work, it is almost a moral certainty that some Babbitt metal will find its way into the aluminum scrap, part of which, during the process of turning and scraping the white metal bearings, and for the rest in diverse unaccounted ways, so that for good aluminum castings no reliance is to be placed upon anything but new metal.

No.	Tensile Strength	Elastic Limit	Mod. of Rupture	No. of Vibrations	Deflection at Breaking Load	Elongation per cent. in 8"	Specific Gravity	Melting point (degrees) C.	Melting point (degrees) F.
12	21,500	12,000	30,240	1,215,750	.450"	1.5	2.82	625	1156
31	29,400	13,000	34,100	608,725	.275"	.5	3.10	611	1132
63	42,500	25,000	51,800	510,900	.325"	.8	3.33	595	1100

The above tests are based upon the use of new metal, and show results obtainable only when the greatest care is taken and the foundry is fitted to do the best class of casting work.

It Stands to Reason

RELATING TO MATTERS OF INTEREST TO THE MAN WHO OWNS AND RUNS AN AUTOMOBILE, AND NOT WITHOUT INTEREST TO THE MAN WHO MAKES IT

That the best automobile to purchase and use is the one that will not break out of financial bounds.

That the motor should be large enough to do the work, with a little power in reserve, but there is no need of having a surfeit of reserve power.

That the lubricating system should be simple and reliable, with some way of telling how much oil there is present, and whether or not it is feeding at the proper rate.

That the ignition system should be such that the motor will crank readily and run well.

That the carbureter should be capable of furnishing a suitable mixture of gasoline and air at all speeds and temperatures.

That the clutch should work without slipping, unless the driver wants it to slip.

That the universal joints should hold grease in order that they will work freely and last long.

That the transmission gear system should afford the requisite number of speed changes, be free from noise, and not "clash" badly when the gears are being shifted.

That the propeller shaft should be fitted with such a system of universal joints as will take care of the angularity, but this is no license to have the angle more than a few degrees.

That the live rear axle should be well made, stout, and the bevel drive should make little or no noise.

That the road wheels should be well secured to the jackshafts.

That the tires should be large enough to sustain under the load without squashing down more than a small part of an inch.

That the chassis frame should be of stout design in order that it will serve as a stable platform for the machinery.

That the steering gear should be free from lost motion.

That castings should not be used in any of the parts that have to do with shock work, if the lives of the occupants of the automobile are at stake.

That the body should be made so that it will not "check" when it is exposed to the weather.

That the upholstery should be of a good grade and free from coloring matter that will "fry" out under conditions of Summer heat, only to blacken up the clothing of the occupants of the seats.

That some form of windshield is indispensable to the comfort of the occupants of the automobile.

That a top of some kind is necessary for touring service.

That good lighting is absolutely necessary from the point of view of safety, and the law demands it.

That a proper horn with which to make signals should be provided; but that its presence should not be abused.

That provision should be made for a supply of lubricating oil sufficient to cover 200 miles.

That the automobile should be washed with great regularity, and that this is no license to scour the surfaces of the body with a dirt-laden rag.

That good common sense should be displayed at all times—especially at the time of selecting a new automobile.

That an extra tire should be taken along, and that several tubes should be in the locker.

That tires will give out soon unless they are kept in a state of good repair.

That a vulcanizing set is necessary if it is proposed to maintain the tires in a good state of preservation.

That good tires are conducive to permanent repairing work, and that the reverse is true of the other kind of tires.

That springs will not work well unless they are lubricated; pry the plates apart and squirt lubricating oil in between them.

That a new broom sweeps clean; be a new broom all the time; some automobilists deteriorate rapidly, and the car is then neglected.

That the life of an automobile is short in the hands of the man who makes a mile in a minute on a road that is barely fit to travel at a rate faster than ten miles per hour.

That going around corners fast is not only dangerous, but it is very hard on tires and some parts of the mechanical structure as well.

That racing up a hill may seem like good driving, but it is not.

That the motor serves very well as a retarding mechanism on a down grade.

That it is a good idea to examine the brakes at frequent intervals, making sure that they will stop the car within a reasonable distance.

That a car can only be brought to a stop within a certain distance in any case, and it is proper to find out just what the distance is for every make of automobile.

That the only device that seems to thrive on noise is a drum.

That noise in an automobile is a sign that some part is awry.

That noise must be stopped or the automobile will stop.

That the sooner noise is stopped the more money the owner of the automobile will be able to keep in his pocket.

That noise is the particular friend of the repairman.

That the repairman should extract the noise from a car if he is paid for the undertaking.

Chain Lubrication

Reason for Running a Chain Dry as Compared with the Method Sometimes Used of Covering It with Grease

THE life of a chain is dependent upon the quality of the metal employed and the lubrication, and presuming the chains to be of high-grade work and material, the lubrication becomes the important question. The first point is: What part of the chain requires lubrication? The pins and rollers undoubtedly; consequently, smearing grease on the outside of the chain has about as much utility as putting thick grease inside an engine and expecting it to act by splash. The pins, and these alone, require lubrication, as when the pins are oiled the inside of the rollers is also lubricated. To make an emery valve-grinding paste one takes powdered emery and mixes it with oil. When grease is smeared on the outside of a chain it collects dust and mud and forms an excellent grinding material to wear the chains and sprockets. At the end of a journey in the rain the chains should be rubbed over with a stiff brush dipped in kerosene, to prevent rusting of the pins, and some oil squirted into the rollers with an oil can. Every 2,000 miles or oftener the chains should be removed and allowed to remain in kerosene for about six hours, or overnight if possible, and thoroughly freed from all dirt; then take four pounds of grease of a vaseline consistency and mix into it about half a pound of flake graphite. Over a flame (a blow lamp will do) turn the mixture into a liquid and steep the chain in it for a few minutes, moving it to and fro so that the grease has a chance of finding its way to the pins. Hang the chain up on a nail over the pail in which the grease has been heated and it will drain off. When the mixture has cooled off whatever remains on the chain should be scraped off and the chain is ready for use. Graphite will greatly quiet the chain.

Amount of Wind Resistance

Retarding Influence Not Great Under 20 Miles Per Hour

ACCORDING to Professor William D. Ennis, when a body bounded by a plane surface is subjected to a normal current of air, or moves normally in still air, a pressure is produced on the plane amounting in pounds per square foot of surface to

$$0.0025\ V^2,$$

in which V is the velocity in miles per hour. The total pressure over an area of A square feet is then

$$0.0025\ AV^2.$$

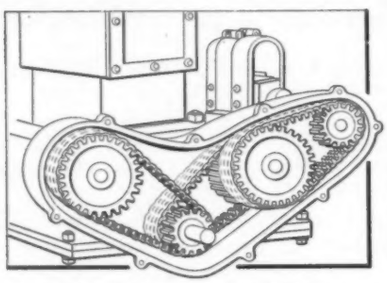


Fig. 1—Cam and magneto shafts operated by silent chains

In an automobile the value of A may be taken as the sum of the areas of the approximately normal surface, since a body partially protected by a wind shield may still be subjected to some resistance as the air eddies around the latter. For the car in question we may then perhaps take A at 28 square feet, whence the resistance is

$$0.0025 \times 28 \times V^2 = 0.07\ V^2 \text{ pound.}$$

No provision is made for measuring this in testing cars by the method referred to; for, although a large fan blows air against the front of the radiator for cooling, the car does not move against this current of air nor does the presence of the latter influence the amount of power exerted by the motor. The tractive forces necessary to overcome wind resistance alone are then about as follows:

Speed in miles per hour	Resistance due to velocity in still air, pounds
10	7
20	28
30	63
40	112
50	175
60	252
70	343
80	448
100	700

If there is a head wind, the velocity of the wind must be added to that of the car to obtain the equivalent speed. Thus a car running at 40 miles per hour against a head wind of 20 miles per hour experiences a wind resistance of 252 pounds. It appears that, as in railroad locomotives, wind resistance is of little importance at low speeds (say, below 20 miles per hour), but of serious effect at high speeds. Therefore, a racing car at 70 miles per hour would experience an extra resistance of 3.06 pounds from an extra normal surface 6 inches square—say, a man's head—and this would sacrifice more than half a horsepower.

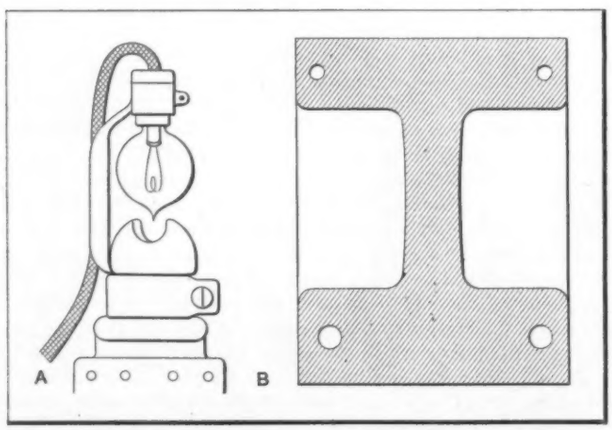


Fig. 2—Method of making electric light holder for oil lamps

Letters from Subscribers

Magneto Wiring and Connections

Editor THE AUTOMOBILE:

[2,428]—Could you tell me how a Bosch Dual magneto should be wired? I can follow the wiring from the magneto to the plug, but where do the wires from the coil go?

Scranton, Pa. R. E. DUFF.

Fig. 5 shows how the wires are attached and the different connections to be made:

1—to circuit breaker on magneto.
2—magneto grounding wire.
3—driving end of magneto to switch.
4—center of distributor to coil.
5—to battery from coil.
6—to earth.

Chains for Distribution Gears

Editor THE AUTOMOBILE:

[2,429]—The timing gears on my car are exposed and make a loud humming noise. Is there any means of quieting them?

Findlay, Ohio. R. C. B.

Exposed gears are always apt to rattle, and when made of raw hide or fiber the dirt that is sucked in the hood causes them to wear quickly. Fig. 1 shows a method that is gaining favor in some parts where the gears are enclosed, and there is no reason that it would not act just as well with unenclosed gears. A metal cover made from sheet tin would keep the gears clean, and a little grease with a small quantity of graphite mixed with it sometimes helps to quiet unenclosed metal gears.

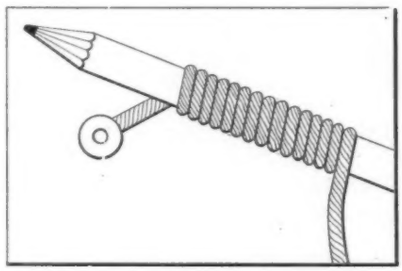


Fig. 3—How to coil electric cable

Grease Gun

Editor THE AUTOMOBILE:

[2,430]—I find great difficulty in filling the rear axle of my car with oil or grease, as the body covers it from the front and the gasoline tank prevents me getting at it from the rear. Could you suggest any method of overcoming this?

Albany, N. Y. L. HENRY.

Find out the size of the plug hole and buy a piece of gas piping to fit it and an elbow already threaded. A plunger can be made of wood. To fill the improvised gun, unscrew one end and force it in the grease can and it will fill itself. A small amount of force will send the grease where it is needed. (Fig. 6.) With another elbow the same idea could be used for oil.

New Lamps for Old Ones

Editor THE AUTOMOBILE:

[2,431]—My car is fitted with oil lamps. How can I adapt these for electric light?

Galveston, Tex. W. F. WRIGHT.

There are several adapters on the market for this purpose,

THIS DEPARTMENT IS DEVOTED TO THE ANSWERING OF LETTERS FROM SUBSCRIBERS ON ANY SUBJECT RELATED TO THE RUNNING OF AUTOMOBILES

but if you wish to do the work yourself take a small piece of sheet brass and cut it as shown in Fig. 2; bend it to the holders and drill for small bolts. The back can be looped to take the wire. It would be as well to coil the wire as shown in Fig. 3 somewhere in the circuit, so that when the exposed part wears it will be possible to pull the coiled part out and have sufficient to make new connections without rewiring or making joints. These coils prevent any pulling or breaking of the wire, which should be attached with staples, placing a piece of rubber between the staple and the wire to prevent chafing.

Piston Ring Holder

Editor THE AUTOMOBILE:

[2,432]—I have obtained some new unslotted piston rings from the factory where my car was built, and as I wish to slot them myself, what method do you suggest to hold them firm? My car is fitted with low-tension magneto, and I wish to equip it with high-tension magneto; what is the best method in which to proceed, and do you think I could manage it myself?

New York City. A SUBSCRIBER.

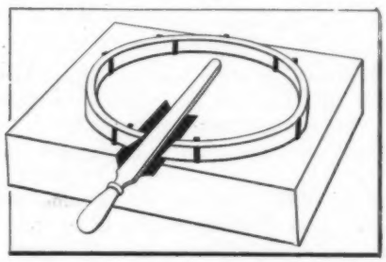


Fig. 4—Method of holding piston ring for slotting

The method of holding rings for slotting is shown in Fig. 4. With this inexpensive tool the rings can either be angle-slotted or step-cut, first using a fine hacksaw and afterwards a fine file. Unless you are used to filing you had better have a mechanic do this part of the work. There is no difficulty in altering the system of ignition. Take the tappets out and make a plate out of quarter-inch metal, bolting it on in place of the tappet. Take out the push rods and cover the holes in a similar manner. Fit gaskets to prevent leaking of compression and oil.

Most low-tension magnetos are run at half-speed, and it is necessary to ascertain if this is the case, as the ordering of the new magneto will depend upon this, the amount of space available on the bedplate and position of the carbureter as to whether the high-tension magneto will fit. The height of the center of the drive from the bedplate must be ascertained, and if this is less on your present magneto than the new one you propose to fit, you can pack up to this with sheet fiber; but if it is more you had better get advice from some one who is used to this class of work.

Cleaning Brass with Salt and Vinegar

Editor THE AUTOMOBILE:

[2,433]—What are the proportions of salt and vinegar for cleaning brass? Will this cleaner injure the brass? J. HARPER.

Gladstone, N. J.

The probability is that salt (sodium chloride) and vinegar (acetic acid) will have a detrimental effect on the brass alloy by eating holes in it and giving it an irregular, rough surface. The abrasive principle is by far the better, as the wear is then at a constant rate and the polish lasts longer.

Calculated Horsepower

Average Autoist Thinks A. L. A. M. Formula Tells Actual Horsepower of a Motor

WHEN a committee of the A. L. A. M. decided to establish a conventional empirical formula for use in comparing motors it was quite well understood that its value would be limited to the advantages to be derived by reducing all motors to a common level and thereafter find out by a more definite means, as a test, how near the motors might perform to the established standard. It was, of course, recognized that some motors would deliver power up to the standard, other motors might fall below the standard, and a few motors might reach to a higher level. It is a great mistake to assume that a designer would take months, or even a whole year, in laying out a motor with no better expectations than to come up to an average formula in private performance. Every designer hopes to be better. The way to ascertain the power of a motor is to test it. The formula states that the power is determined as an approximation at 1,000 feet of piston travel, as follows:

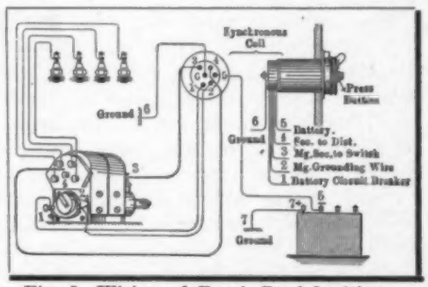


Fig. 5—Wiring of Bosch Dual Ignition

$$HP. = \frac{d^2 n}{2.5}$$

when

d^2 = the square of the bore of the cylinder in inches.

n = the number of cylinders.

2.5 = an empirical divisor based upon the average performance of automobile motors and a piston travel of 1,000 feet per minute, thus making it unnecessary to consider the angular velocity of the crankshaft.

A numerical example of the above formula for a four-cylinder, four-cycle motor, with a bore of four inches and a stroke of the same, would be as follows:

$$d^2 = 4 \times 4 = 16$$

$$n = 4$$

when

$$HP. = \frac{16 \times 4}{2.5} = 25.6 \text{ horsepower.}$$

The mere figuring out of the horsepower in the manner as above shown has no more to do with the actual horsepower of a real motor than the drawing of a battleship would have to do with its gun-power in a real engagement. It is a fortunate circumstance that when a theory gets in the way of a practice the theory gets run over—the facts remain. There are, of course, motors of this size that will deliver 25 horsepower and there may be motors that will deliver more than 25 horsepower, but there are also a large number of motors that will not deliver 25 horsepower, and the great main point is to find out what they will deliver, rather than to assume that they are up to a standard.

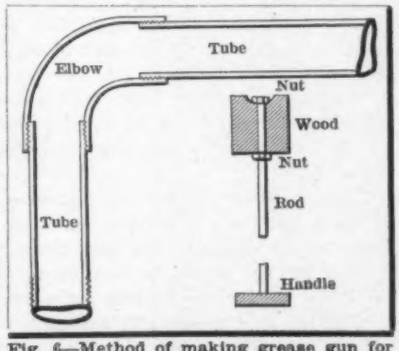


Fig. 6—Method of making grease gun for inaccessible places

Questions That Arise

SOME OF THOSE THAT COME UP IN EVERY-DAY AUTOMOBILING ARE ANSWERED BY THE MATTER WHICH IS BEING PREPARED BY FOREST R. JONES IN THE NEW EDITION OF THE "AUTOMOBILE CATECHISM" THAT WILL SOON GO TO PRESS

[281]—How can the inner tube of a double tire be removed and replaced by another?

First lift the wheel free from the ground with a jack and deflate the tire. If of the clincher type, with tire lugs (clamps), first loosen the nuts on the radial bolts that hold the heads of the lugs down against the inner surface of the outer shoe; also remove the nut, or nuts, from the valve stem. Remove one side of the outer shoe from the clincher groove. A pair of blunt irons (prodders) about 3-4 inch to 1 inch wide and 1-8 inch or less thick at the end are most commonly used for prying the tire off on one side. Care must be taken not to pinch and tear the inner tube. Remove the inner tube by pulling it out by hand, beginning at the part farthest from its valve, and then by the use of an iron suitable in shape for raising the outer shoe somewhat, take out the valve from the rim of the wheel. A double-prong iron can be used by placing a prong under the shoe on each side of the valve.

If the tube has been punctured, feel inside of the shoe to find whether anything is still projecting through the tire that will injure the inner tube when replaced. Also see that there are no sharp points or edges on the tire lugs.

Rub a liberal supply of powdered talcum (soapstone) on the inner tube, also place a liberal supply inside the shoe and rotate the wheel slowly, at the same time kicking or striking the shoe so that the powder will be well distributed over its inner surface. Place the tube in the shoe. Inflate it slightly to straighten it out, which may need some assistance by hand. Pass the hand carefully around the tube to make sure there are no twists or folds. Then, by the use of tire irons, force the shoe back into place, remembering that each clamp must be lifted as the part of the shoe next to it is sprung into position.

Push the clamps up to see whether the inner tube lifts freely. If not it may be pinched under the clamp and should be released. There should be a leather or rubber washer under the clamp nut to prevent the entrance of water and grit to the tire. Tighten the clamp by hand and inflate the tire so that it will bulge only slightly at the sides where it rests on the ground. (Pressure gauges to use with a tire pump can be purchased.) Try the clamps again to see that they are tight. Thumb nuts on the clamps can be made tight enough by hand.

When the outer shoe is to be completely removed from the rim, the clamps or lugs must be taken entirely out after removing the inner tube. A tire iron suitable for lifting the shoe at that point facilitates this operation. Numerous forms of tire irons are in use. None seems to have any great advantage over the others.

A stubborn tire shoe can sometimes be quickly put in place by sitting down and pushing against its side with both feet, at the same time striking the flat part of the bead with a hammer that has well-rounded edges.

Various convenient tools for forcing a tire-shoe back into place on the wheel can be found on the market.

[282]—How can a temporary patch be put on the outside of an inner tube?

Manufactured patches can be secured for this purpose, or a patch can be cut from a sheet of rubber or an old inner tube whose material has not deteriorated appreciably. Only rubber patches should be used on the inner tube. Canvas, etc., will not do, because it does not stretch like rubber.

Rub the tube around the puncture with a piece of sandpaper, emery paper, or a clean fine file over an area somewhat larger than the patch to be used. The space to be covered by the patch must be clean and free from partly torn-out pieces of the rubber. The clean space should be somewhat larger than the patch.

Liquid rubber cement is used for fastening a temporary patch in place. There are almost numberless makes of it. Some dry, or set, much more rapidly than others. The directions for using generally accompany the better grades.

See that the tube is perfectly dry, especially that there is no water on it when beginning to cement on the patch. The patch should also be dry.

In the absence of directions on the cement tube or box, the patch may be put on as follows:

Apply the cement with a brush to the rubber tube and one side of the patch. Wait till the cement dries enough to become sticky. Then place the patch on the tube, taking care to put it on with a rolling motion so as to exclude all air from beneath it. Press the patch on firmly, first pressing at the center and gradually working out toward the edges. A small, narrow roller in the end of the bar is a suitable tool for pressing the patch on. It is used by rolling it back and forth across the patch, gradually working side-wise at the same time. The tube should be laid on a smooth surface under the place where the patch is being applied. Lay a smooth piece of board on the top of the patch and weight it. Leave until the cement sets.

If it is not known how long it will take the cement to set, a couple of test pieces of rubber may be stuck together with some of it after the patch is put on. The test pieces can be pulled apart, a little at a time, to note the condition of the cement.

Coat the patch with talcum or other powder to prevent its sticking to the shoe.

A patch put on in the above manner without vulcanizing will last for some time, if the tire does not become hot, as by rapid running of the car. Heat softens the cement and the patch becomes loose.

The patch is sometimes put inside the tube by the repairman.

[283]—How can a small cut or tear in a tire be repaired?

Scrape the rubber clean in the cut or tear and fill it with prepared plastic rubber. Then vulcanize it at the repaired place.

Drain Cocks

They Must Be Provided for If the Motor Is to Be Properly Protected In Winter

OF the 400,000 automobiles that are now in service, 213,000 were built prior to 1910, and of this considerable number of cars many of them are so lacking in harmony that the hydraulic grade idea is missing from the cooling system. Perhaps nearly all the owners of these cars have gone through at least one Winter's experience, and those of them who succeeded in protecting their motors from the effects of freezing probably did so by putting drain cocks in at various points and taking the pains to open them every night in order to let all the water out. In many cases, no doubt, the freezing question was handled through the proper use of non-freezing solutions, one of which is composed of glycerine and water, using about 30 per cent. glycerine in solution. Of those who rebuilt their automobiles to the extent of putting drain cocks in at low points, some of them found that it took several drain cocks to satisfy the situation. If anti-freezing solutions are taken advantage of, it still remains to have drain cocks at the low points for the purpose of getting rid of the worn-out liquid—it does wear out.

Carbureter Action

BEING AN ABRIDGMENT OF A PAPER READ BEFORE THE BRITISH INCORPORATED INSTITUTION OF AUTOMOBILE ENGINEERS. BY W. MORGAN, B.SC., AND E. B. WOOD, M.A. (CANTAB)* (FIRST INSTALLMENT)

THE work on which the following results and conclusions are based was undertaken at the Daimler Motor Works some three years ago as preliminary to an attempt to design a paraffine carbureter suitable for traction work. The difficulties of the task were twofold, the low volatility of the paraffine giving rise to one set of problems, while the narrower limits of smokeless and odorless combustion, as compared with those of petrol, intensified the difficulties met with in an ordinary carbureter of obtaining suitable fuel mixtures over the wide range of demand required by a modern road engine. It was therefore necessary to find or design a carbureter which could give a mixture of fairly constant composition. Investigations which had been made on carbureter action assumed the steady flow of both air and liquid fuel, with apparently misleading conclusions when applied to designing a carbureter for the engine.

Dr. Watson, in his paper on "Thermal and Combustion Efficiency" (Proc. I. A. E., 1908-9, pp. 387-473), shows the character of the pressure variation in the induction pipe of a four-cylinder petrol engine at a speed of 656 revolutions per minute with open throttle (see Fig. 1, copied from Dr. Watson's paper). In this particular case it appears that actual reversal of flow takes place, so that any argument based on steady flow must be regarded with suspicion.

It was decided to ignore as far as possible all formulæ relating to steady flow, and to measure directly the related quantities of gas and liquid induced under the engine suction. In the first series of experiments, as will be seen, the writers fell from grace, and estimated from pressure the amount of exhaust gas dealt with. The possible danger of error was recognized, but as the necessary apparatus for directly measuring the volume of air was unobtainable and the correctness of the conclusions based on this method was confirmed by gas analysis, no misgivings were entertained as to the general accuracy of the results.

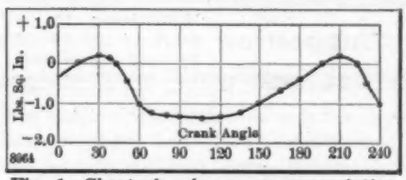


Fig. 1—Chart showing pressure variation in the induction pipe

Last year it was found possible to lay down a more complete equipment at the Merchant Venturers' Technical College, Bristol, and to confirm the results of the previous work.

The outfit at the Daimler works consisted of a standard four-cylinder engine, 124 millimeters bore by 150 millimeters stroke with tappet valves, driven through a belt and speed cones by a two-phase motor. The engine was fitted with a graduated petrol gauge and the exhaust passed into a small tank of about 2 cubic feet capacity perforated with several 1-2-inch holes; the pressure in this tank was read on a suitable gauge and converted into volumes. The motor was an 8-horsepower, direct-connected, and the speed regulated by inserting a water resistance in the armature circuit. Great constancy of speed was obtained and over a 10-minute run the speed variation was less than 0.4 per cent.

The petrol gauge was designed with the object of enabling readings of petrol consumption to be taken with an engine running under its own power without stopping from time to time to refill the gauge.

The carbureters used in the first experiments varied in form, but the plain-tube carbureter used at Bristol will serve as a type of the others. The section is shown in Fig. 2 and it is seen to have consisted of a gas cock in a straight tube fitted with bushes of various diameters and standing over a petrol jet which stood inside the bush. Pressures at the jet were read by means of a fine brass tube fixed near the jet.

The earlier carbureters used were simply lengths of 1-1-4 inch copper pipe swept horizontally so that the air flowed across the jet and not along it. In the later experiments the air was measured by observing the time required to pass 30 cubic feet into the gasholder, observations of temperature and barometric pressure being made. In the last series of experiments which were taken to confirm previous work, the barometer, temperature and humidity were so nearly constant that it was thought unnecessary to apply an atmospheric correction which would affect all readings proportionally. In several cases the correction factor was found to be 1.005. Again, no correction has been made for the volume of petrol vapor, as this correction does not affect the main conclusions which follow, as will be shown later.

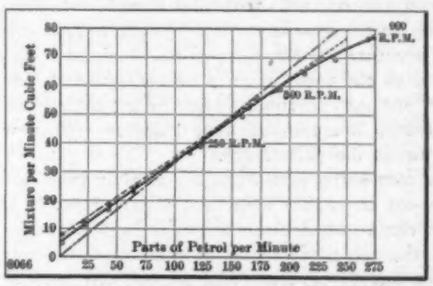


Fig. 3—Characteristic graph for plain-tube carbureter

The gas measurements further required a correction for leakage on the induction and the exhaust side of the engine. On the induction side, beyond making the induction pipe joints gas tight, no attempt was made to prevent leakage. There was no perceptible leakage past the pistons, but at high vacua there were indications of considerable air flow up the valve guides, although the valve stems were a good fit and were well lubricated. It was decided to allow this leakage to continue as it was a factor with which the carbureter must deal. Afterward it was argued that this leakage could have varying relative values with different engines, so that it was desirable to obtain a value for it; accordingly a correction was obtained in the following manner. The engine was first run with closed throttle and the quantity of air passed into the tank per minute measured; at the same time the suction in the induction pipe on the engine side of the throttle was taken.

The throttle was then opened to successive marked positions with the engine running at a constant speed and the suction in the induction pipe noted at each position. The value of this correction is shown by means of the dash line in Fig. 3. In this petrol per minute is plotted against air per minute taken by the engine at different speeds and throttle positions; the plain line graphs are corrected for leakage and give the relationship between petrol and air which has passed the jet.

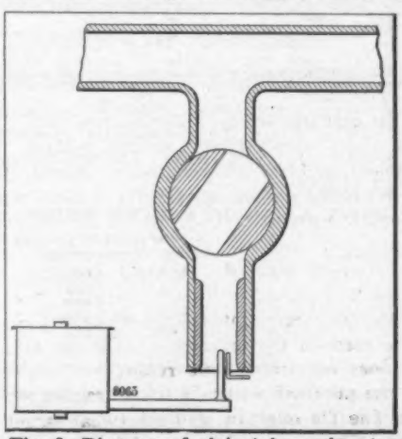


Fig. 2—Diagram of plain-tube carbureter used for tests

From "The Commercial Motor."

With regard to the correction for losses on the exhaust side it was found that with clear exhaust pipes the back pressure never exceeded 48 inches of water and with the 500 revolutions per minute series of experiments 24 inches. The leakage at this pressure was less than 1-2 cubic foot per minute at open throttle and fell away very rapidly with closing throttle. No correction was made for this leakage.

The results are presented in the form of graphs, which have been obtained from simultaneous readings of petrol and air as shown in Fig. 3 and those following.

Fig. 3 may be taken as typical of the whole. This is the petrol-air graph of the plain-tube carbureter at the approximate speed of 250, 500 and 900 revolutions per minute with a bush 3-4 inch in diameter. It will be seen that the main parts of the superimposed curves lie on a straight line and that the upper end of the graph for each speed droops toward the petrol axis. Neglecting the drooping parts of the graphs for the present, it then follows that the law connecting the flow of petrol and air in a carbureter of this type is of the form $y = a \times bx$. This conclusion is borne out by every similar experiment made by the authors on various engines, which include four old type Daimlers, two new type Daimlers, one Talbot and a Darracq.

Accepting this law connecting petrol and air in plain-tube carbureters, the running of an engine with such a carbureter is at once explained. The chain line in Fig. 3 shows the graph of constant fuel mixture of such composition as will approximately give complete combustion of both air and petrol; this may be called the ideal line or line of correct mixture. Any point on a graph lying between the air axis and the ideal line indicates a weak mixture, while a point on the other side of the ideal line indicates a rich mixture. It is now clear that this plain-tube carbureter must give a weak mixture until the consumption reaches 30 cubic feet per minute; for higher gas consumption the mixture becomes richer. Hence the graph shows, as is borne out by experience, that with this carbureter the engine would be difficult to start without flooding, would not run or pull at a low speed and when opened out the mixture would be slightly rich. It is a defect of this type of graph that it does not readily show the percentage variation from constant mixture. Fig. 3 shows the percentage composition of the mixture plotted against air.

It should be borne in mind that all the graphs shown are corrected for leakage on the induction side of the engine, hence the point of intersection on the air axis appears lower than actually is the case. This correction leaves the type of the graph unchanged; the same is true of the correction which could be made for the volume of vaporized petrol. The volume of petrol vapor is proportional to the quantity of petrol taken, hence the correction would tend to slightly decrease the inclination of a graph. Here, again, the type of graph is unaltered, so that the main conclusions are unaffected. The value of the point of intersection of the curve with the air axis is of importance, for if this were lowered to zero the plain-tube carbureter could be made to give quite good results.

Effects on engine speed are at once obvious from Fig. 3. The straight line part of the characteristic is extended along the line $y = ax + b$, which is peculiar to that arrangement of the carbureter, while the droop is but very slightly modified, if at all.

The size of the jet modifies the slope of the straight line characteristic as might be expected. Fig. 3 gives the graphs obtained with two jets, the smaller having an aperture one-half the area of the larger. The characteristic is seen to swing on the point of intersection with the air axis, so that by suitably setting the jet the characteristic of such a carbureter may be set parallel to or at any desired angle with the ideal line.

Economy and Speed

The Relation Between Rate of Speed and Amount of Fuel Used is Fixed

IS it not strange that there is so much talk about economy in the use of fuel in automobile work, and an inclination on the part of many autoists to look for more economical machines in some form of construction that is not now commercialized, as if to point out that present practice is ill-advised? It is like trying to show that experience is wrong, that the designers who have industriously labored for a number of years failed to take the right road, and are afraid to turn back. Observation seems to indicate that the men who dream the most, and articulate the loudest, are the very automobilists who disregard every consideration for economy, entirely overlooking the fact that if they fail to conform to the reasonable demands of the situation, it is up to them to pay the penalty, whatever it is. There is an economical speed for every automobile, and this speed depends upon the weight of the car. Designers are compelled to provide motors that are capable of driving automobiles on the level, hard road at speeds that are higher than economy dictates. This excess speed comes from the necessity of providing power enough to propel the automobiles up steep hills and through long stretches of soft going. The economical speed for weight is about as follows:

PROPER SPEED TO DRIVE A CAR OF A GIVEN WEIGHT

Miles per hour	Weight in pounds (maximum)
28	1,000
20	2,000
17	3,000
13	4,000
12.5	5,000

These speeds are all too low to suit the average automobilist, but disregarding them is at the extra cost of tires, and the man who elects to go faster has no rightful ground for complaining about the life of the tires.

Standardization Suggestion

Maintaining the Appearance of a Car May Demand a New Body

FREQUENTLY it is found that an automobile is doing good work even after two or three years' service, but the practice of bringing out new models every year has the demerit of rendering old models passé. One way to recoup this loss is to put a new body on the old car and thereafter refinish, thus bringing it up to date, in so far as it is possible to do so, and within a reasonable cost. Reasonableness of cost must always be judged in the light of the broad possibility. If there is no standard to go by, so that bodies cannot be produced for stock, the reasonable cost will be based upon the production of one body for the specific purpose, as a special effort. It would be a step in the right direction to write "reasonable" in front of a much lower cost than that due to the making of one body, but this can only be brought about if bodies are standardized. In France it has been the practice for seven or eight years to make bodies to a standard width, and some of the lengths, as follows:

RULING LENGTHS OF BODIES IN FRENCH AUTOMOBILES

Length in metres	Equivalent in inches
2.00	78.74
2.10	82.67
2.20	86.61
2.30	90.55
2.40	94.48
2.50	98.42

Unless American body builders will adopt the metric system of measurement it might be well to fix upon a standard of length of American bodies, arranged in even inches, as 75, 80, 85, 90, 95, 100, 105, 110, etc., or 72, 78, 84, 90, 96, 102 and 108. Perhaps the latter arrangement would be the most appealing in view of the six-inch increments intervening, thus affording a definite relation to the English foot.

Ravages of Tinkeritis

Herbert L. Towle Fell In With Carrington Again

I FELL in with Carrington again on the train the other day. Carrington, you know, owns a Hurriup runabout, and from the height of his four years' experience with successive models of that celebrated make, he surveys with much edification the 'prentice efforts of his friends to get along peaceably with similar machines. His last experience was with Snyder, who has had his little red Hurriup for about five months.

"I got a telephone call last Sunday," said Carrington, "begging me to run over and see if I could help Snyder get his car started. Previous adventures in helping Snyder out of his troubles had made me wary, so I asked him where the machine was. It was just down the hill, a couple of yards from Snyder's house, the other side of town. So I got into my car and ran over. I found that Snyder and a darky, who had appeared out of nowhere to help him, had been taking turns at the crank for an hour or two. Snyder or the darky would whirl the crank to beat the band; the motor would spit once or twice, or would do nothing whatever, and after each whirl Snyder would give the vibrator screws a twist. The vibrators were working as well as could be expected under such treatment, so after adjusting them properly I investigated the sparks at the plugs.

"After finding the sparks O. K. I turned the crank. I got four or five explosions and the engine stopped. After repeating, with a like result, I looked at the carbureter. The needle valve was two full turns open, though half a turn was more than enough. How under the canopy that man had ever persuaded his engine to run at all with such a dose beats me. I screwed the needle valve down to where it ought to be, judging from the feel, but still the engine did not run. Then I took the needle out, and found it had been bent four ways from Sunday by my friend's strenuous efforts with a screwdriver on some previous occasion. No wonder I couldn't get the right mixture! Snyder promptly declared he could straighten the thing, and was off with it to the garage before I could stop him. So I went up on the porch and chatted with the ladies. After a while Snyder came back, announcing that he had straightened the needle, and asked me to put it in. I laughed at him.

" 'Not on your life,' I said. 'I'll put in a new one, if you like, but I won't waste a minute fooling with that busted thing.'

"It is funny," I observed, "how hard it is to teach amateurs the importance of a hundredth of an inch in things like that."

"Indeed it is!" responded Carrington. "As I was saying, I refused to touch the thing further, and the end of it was that Snyder got a mob of boys together and he and they and the darky pushed the runabout to the garage while I steered."

"A man like that makes more trouble for himself than the slickest chauffeur could for him," I observed.

"Say," burst out Carrington, "it just beats creation how many ways Snyder can find of queering a perfectly good machine. I'll bet anything that by ten o'clock this morning he will have either a cylinder or an axle or the radiator off his car, hunting for some fool thing that would have been all right if he had only let it alone. You expect to see amateurs meddle with the little things, like adjustments, but this man is not satisfied with that. It is only the big things that interest him. For example, his high-tension system was leaking like a basket the other day. I touched it somewhere, and it knocked me about six feet. I told him he had better run new cables to his spark plugs, but such a matter was too trivial to interest him."

"He must need education badly," I said.

"He has the worst case of tinkeritis I ever saw," responded my friend. "If his car was running beautifully, like a sewing machine, with absolutely nothing the matter with it, he'd want to know why it was running beautifully, so he'd take off the cylinders. And when he got them on again he'd mix the valves or do something else so the car wouldn't get out of its own way.

"You know the front axles of those cars are guided by a wishbone of steel tubing. Well, lately, Snyder thought that the connections from the wishbone to the front axle didn't look just to suit him, so he took off the wishbone, plugged it with sand, and put a neat bend in each leg close to the front axle. The result is that the knuckle pivots now rake backward like a bicycle fork reversed, and it is almost impossible to steer the car at all. It tries to slow off, first to one side, then to the other, in spite of anything you can do."

"Is he really a natural mechanic, who has simply not learned to apply his bent, or is he just one of those who rush in—you know the line?"

"He isn't a mechanic in any sense of the word," replied Carrington. "He has a certain amount of common sense, but his ignorance of mechanics is wonderful. He is learning, though! You bet he is learning, and he is paying for it, too. For example, I noticed a while ago that one of his rear tires had a flat spot on it, where apparently it had slid when he set his brakes a trifle hard. A few inches of fabric were exposed, and I advised him to take the shoe off and send it to a vulcanizing shop. But no, that was too simple for him! All the tire needed was a patch, and he guessed he could put the patch on as well as anyone. So he spent a couple of hours cutting a piece from an old inner tube, scarfing its edges down as neatly as he could, and cementing it over the flat spot."

"What sort of cement did he use?" I asked, with a grin.

"Just common ordinary cement; the kind that comes in tin tubes. Well, of course, the patch came off right away when he ran the thing. Then he thought the reason it came off was that the front edge could peel up, and that the way to make it stick was to have an endless band all around. So Snyder actually put in half a day peeling all the rest of the tread from that perfectly good tire, and cementing an endless band from an inner tube all around it."

I gasped.

"Needless to say, his beautiful endless band parted company with the tire without much ceremony. A few days later, he invited my nephew to go with him for a ride. I knew what that meant, and warned the boy that he would probably have to work his passage. He went, however; guess he wanted to see the fun. Before they had gone fifteen miles that re-treaded tire went bang! where water and his surgery had weakened it.

"The other day, after I had steered his car into the garage, he asked me what I thought he ought to do with it. I said to him, 'Snyder, I'm your friend, and I'll help you with this car to the point of getting it so it will run. But that is absolutely all I'll do. You have put the rig on the bum in too many ways for me to feel inclined to have a hand in it. When you get it so it will run, take it to town and ask the agent for his best offer in part trade for a new car. Take his offer, even if it is only fifty cents. And, when you get the new car, for Heaven's sake *let it alone!*' "

Properties of Aluminum

Specific Gravity Changes with Thickness of Castings

IT has been shown that the strength of aluminum castings is greater for thin than for thick walls, and it is also true that the specific gravity of the metal is increased as the walls are cast thinner. The approximate variation in specific gravity of the metal is as follows:

Thickness in Inches	Specific gravity corresponding
1 (square)	2.964
3-4	3.004
5-8	3.002
9-16	3.004
1-2	3.012
3-8	3.024
1-4	3.007
1-8	3.007

Note.—It is true that the variations in specific weight, as noted, were not uniformly increasing as the thicknesses of walls decreased, but the indication is pointedly in favor of increasing weight with decreasing thicknesses of walls.

Practical Repairing

DISCUSSING THE OVERHAULING AND REPAIRING OF CYLINDERS; WITH AN ILLUSTRATION AND DESCRIPTION OF AN AIR TEST AND A REPLACEMENT

CAST gray iron is universally employed for cylinders, it being a product that pours into moulds with a fluidity sufficient to produce thin walls, and under proper conditions a closeness of texture that holds compression sufficiently for the intended purpose. It is also true of this material that it withstands heat changes, as they obtain in motor work, and the wearing surfaces take on a darkened bronze-like luster that is quite permanent, excepting when the design is inferior and the castings are below the customary standard. But the best-made cylinder must wear in time, and in order to hold compression thereafter it becomes necessary to refinish the bore, make new pistons to fit, and supply new piston rings to match. It not infrequently happens that the cost of the overhauling work is greater than the cost of a new set of cylinders; this depends upon the price asked for the repair parts by the maker of the automobile as against the amount of work that will have to be done to put worn-out cylinders in a state where they will perform efficient service.

There is no way of stating clearly the best course to pursue, excepting after an examination of each individual repair case. Some cylinders wear to an elliptical bore, due to great angularity of the connecting rod coupled with high compression and high speed. In such cases it is easy enough to measure the difference between the major and minor axis of ellipse, and if it amounts to more than two or three thousandths of an inch nothing remains but to refinish the bore. In refinishing work the first consideration is to measure the thickness of the wall of the cylinder, and if it is not of the uniform thickness account of this fact must be taken. If the thinnest point in the cylinder wall is under 3-16 of an inch, it is scarcely to be supposed that it will be worth while to undertake reboring, on the ground that the strength of the wall will be insufficient for the purpose. If the finished section of the cylinder wall is found to be ¼ of an inch or better, reboring becomes an excellent possibility, although these questions are coupled up with the dimensions of the cylinders, it being the case that the greater the bore the thicker the wall should be.

Fig. 1—Method of air-testing cylinders, showing casting in a tank of water, and compressed air being forced into water jacket

Independent of the dimensions of the cylinder the pressure varies depending upon the compression, efficiency of the ignition system, and quality of the mixture, the latter depending upon the carbureter. It is not uncommon to take manograph cards from cylinders of motors that show an explosion pressure of 300 pounds per square inch, and certainly in considering the maximum possibility it would not be too much to expect that this pressure might go up to possibly 400 pounds per square inch, not as a regular thing, but under a conceivable set of conditions, and it must be remembered that breakages do not come from a long series of abuses, but, as a rule, from a single excess.

Granting that an examination of the cylinders of a motor discloses a sufficiency of the elliptic condition to require that reboring be done, it remains to fix upon the method to pursue, and, if the repair man has a choice of facilities, he will readily select the grinder without resorting to reboring, not only on account of the speed at which grinding can be done, but because of the excellence of the result. If there is no grinder at hand, and the difference in bore is a matter of two or three thousandths of an inch, a reamer suggests itself, or even a cat-head will do. In either event the cutters must be sized to precision, and fairly inserted in the bore of the cylinder by a repair man of some skill. The work can be done upon either a drill press or a lathe.

There still remains a very excellent means for refinishing cylinders if the difference is within ten thousandths of an inch. Cast a disc of lead or Babbitt metal to a diameter slightly greater than that of the cylinder, with an axlewise thickness of perhaps two inches. Bore a hole in the lead disc, or cast it with a chord hole, and clamp the disc so made on a mandrel, fetching it up tight, thereafter setting the mandrel up in centers, and turning the disc down to a diameter of three or four thousandths of an inch greater than the bore of the cylinder to be finished, tapering the diametral face of the so made lead lap slightly to give it "entrance." When the lead lap is ready it remains to smear it over with cylinder grinding compound, the latter being of ground glass rather than of emery or carborundum, starting with a relatively coarse grade of the abradant, ending with the finest grade in order that the bore will be perfectly smooth. In operating this equipment the work may be done on a drill press, or better yet, on a platen type of lathe, unless a vertical milling machine is available, in which event the cylinder may be set up on the platen, and the lead lap may be chucked. With the cylinder adjusted on the platen so that its axis coincides with the axis of rotation of the lead lap, it remains to feed the cylinder up against the tool, rotating the latter at some convenient speed, and it will be found that by feeding the cylinder up and down a few times the bore will be increased perhaps two thousandths of an inch per feed, and the elliptic condition

Fig. 2—Process of replacing cylinders, showing how two workmen guide cylinders over pistons without damaging the rings

will be taken out of it, leaving the bore perfectly round and quite smooth. As a last resort, the cylinder may be tooled out on a drill press.

It might have been stated that there is no use of boring out a cylinder if the valve seats are worn down so much that no metal will be available for dressing them. Leaving this part of the repair question for future treatment, assuming only for the time being that the seats are not worn too much, it remains to point out that after refinishing the bore it will be desirable to test the cylinder for tightness, and this may be done in the manner as shown in Fig. 1, in which C1 is the cylinder, W1 is the water pipe, H1 is a hose connection, and P1 is an air pump of the hand variety. The cylinder is submerged in water, and air is pumped into the water jacket proper under pressure, with the result that if there are any leaks bubbles of air will show up in the water.

One of the hazardous undertakings in connection with cylinder repair work comes when it is desired to replace the cylinders, as shown in Fig. 2. In this case the cylinders C1 are being slipped over the pistons P1, and one man is engaged in holding the cylinders in the vertical position while a helper compresses the piston rings and guides the cylinders over, both operators working together and exercising great pains in order not to damage the piston rings. The helper is holding the rings firmly in the slot, with the right hand, and with a flat-blade knife in the left hand he is guiding the piston into the bore, taking advantage of the bevel around the extremity and compressing the rings at the same time. It is a tedious operation at best, resulting too often in the damaging of the rings, which can only be known when the motor is started up and it is found that the compression is poor.

Expense Account Compiled

U. S. Jameson, of Worcester, Mass., Shows How to Operate an Automobile

EVERY man understands how easy it is to get rid of money if no account is kept of the individual expenditures. The pennies mount into dollars, and the dollars pile up, until finally the victim is brought to a halt by the glaring evidences of a shortage in his funds, there being no other way out of it under such conditions. It cannot be said that the coming of the automobile has altered this fundamental situation; some automobilists maintain that the trouble is even more acute. From time to time level-headed automobilists send in their well-kept expense accounts, one of which is here given, and in addition to the direct evidence of cost afforded there is the possibility of finding out just what are the most troublesome items, after which it is possible to treat with them, hoping, perchance, that they will bow to intelligent action.

In this particular example the car was operated from April to October, inclusive, covering 8,750 miles, and the largest item of total expense was for repairs and painting. Particular attention is called to the foresight of the automobilist who had the good sense to include repairs and painting in the cost of maintenance. The next largest item was for the salary and maintenance of the chauffeur, and then come tires and tubes. It is just possible that the repair account could be reduced were the chauffeur more capable; it is not the purpose here to state that this particular chauffeur received too much money, or that he was in any way negligent, but the fact remains that if the owner had driven himself he would have saved $355.20 that he paid the chauffeur, and he might have saved some of his repair and painting account. Moreover, the tire and tube account of $344.22 presents a rich field in which a careful owner has a wide opportunity to distinguish himself. Mr. Jameson, in offering this evidence of cost, states:

"Your readers may be interested in the carefully kept expense of operating a touring car on its fifth season. The following figures are reliable:

"Five-passenger, 4-cylinder touring car of standard American make, built in 1906. Weight, 3,300 pounds. Tires, 34 x 4 and 34 x 4½. Season, April to October, inclusive. Mileage, 8,750, half in city, half in country."

Items	Total expenses	Cents per mile
Repairs and painting	$433.04	4.94
Tires and tubes	344.22	3.94
Supplies and miscellaneous	96.65	1.10
Chauffeur	355.20	4.06
Storage and washing	123.88	1.42
Gasoline	191.89	2.19
Oil	48.80	.56
Grease	5.35	.06
	$1,599.03	18.27

"Civilization is a function of industrial production and industrial production is a function of technical insight." This epigram is somewhat widely quoted in Germany as expressing the protest of the technical world against the domination of the untechnical, lawyers, legislators and merchants, for example, in shaping the living conditions and institutions. It is the gist of an article on the subject in *Automobil-Welt* that technical bodies should make themselves felt in political activities and assert their superior rights for deciding ways and means in the advancement of civilization.

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, RACES, HILL-CLIMBS, ETC.

Nov. 19-26.....Oakland, Cal., Idora Park Show, Under Management of Oakland Automobile Dealers' Association.

Dec. 1.....Chicago, Ill., First Annual Aeronautical Exhibition in the Coliseum.

Dec. 31-Jan. 7, '11.New York City, Grand Central Palace, Eleventh Annual International Automobile Show.

Jan. 7-14, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Pleasure Car Division, Association of Licensed Manufacturers.

Jan. 11-12.....New York, Annual Meeting, Society of Automobile Engineers.

Jan. 14-28, 1911..Philadelphia, Annual Show, Philadelphia Licensed Automobile Dealers' Association, Third Regiment Armory.

Jan. 15-21, 1911..Detroit, Wayne Gardens, Detroit Automobile Dealers' Association.

Jan. 16-21, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Commercial Division, A. L. A. M.

Jan. 28-Feb. 4,'11.Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.

Feb. 6-Feb. 11,'11.Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.

Feb. 18-25.....Minneapolis, Minn., Annual Show Minneapolis Automobile Show Association, National Guard Armory.

Feb. 18-25.....Binghamton, N. Y., Second Annual Show, Binghamton Automobile Club and Chamber of Commerce, State Armory.

Feb. 18-25.....Newark, N. J., Annual Show, New Jersey Automobile Exhibition Co.

Feb. 24-27.....New Orleans, La., Annual Show, New Orleans Automobile Club.

Mch. 4-11, 1911...Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.

Mar. 25-April 1..Buffalo, N. Y., Fourth Power Boat and Sportsmen's Show, Sixty-fifth Regiment Arsenal, Buffalo Launch Club.

Mch. 25-Apr. 8....Pittsburg, Annual Show, First week, pleasure cars; second week, commercial trucks. Automobile Dealers' Association of Pittsburg, Inc.

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IGNITION problems, of which there are a number, are in a more or less chaotic state in certain respects, despite the strides that were made and the relatively perfect methods, of which there is so much to be said in a favorable way. The introduction of the manograph as a means of photographing the wave of pressure during the power stroke affords an insight and a means of comparing the various classes of ignition equipment and the efficacy of the several plans. The most recent investigations of the thermic performance of motors utilizing the manograph show that one spark, well timed, is all that the occasion requires when the speed is low. The result is precisely the same with or without a magneto at this low speed, provided only that the timing is propitious. As the speed is increased difficulty is experienced, and an acute ambition creeps in as the speed advances from approximately 800 revolutions per minute. One safe conclusion is that the spark plug should be located in the region of the intake valve. There is a positive gain also if two sparks are delivered in the mixture simultaneously.

* * *

REVIEWING the practice abroad as it is being displayed at the Olympia Show in London, is not disconcerting from the point of view of the American designer; British practice, as it is reflected for 1911, indicates that the "economy bug" is in full control of the thinking apparatus of the English engineer. The reports coming over, however, to the effect that small cars are ruling, fails to take into account the overshadowing influence of a surfeit of taxicabs. Take the taxicabs away and English automobile practice will then be found more or less as it was last year. Discussion in the past is father to the thought that the English were bent on eliminating poppet valve types of motors, substituting rotary and sleeve-valve mechanisms, taking the Knight motor as the standard to go by, or the thing to get around, as the case may be. An examination of the Olympia Show proves quite conclusively that the English designers failed to get around the Knight patents. The prevailing opinion is that trouble was encountered and most of the innovators are delighted to be back home among poppet-valve motors. If the English designers failed in their attempt to substitute something better than poppet valves for motors, they have at least introduced many little refinements, and the cars, taking them as a whole, are refined.

* * *

WIRE wheels are used more extensively than ever in English automobile work, but an article on hickory, which appears this week in THE AUTOMOBILE, presents the main reason for this partiality to wire construction. Every man who ever had anything to do with a bicycle will have a positive opinion that will not be entirely favorable to wire wheels. The other side of the story is that hickory is not a familiar product in Great Britain and the time has arrived in American forestry when the conservation of the hickory supply is a paramount issue. The Forest Service of the United States Department of Agriculture is giving this important problem distinguished consideration, pointing out the waste that runs riot, and how wood-choppers disregard every consideration for economy. The support of the automobile industry is due the Department in this important undertaking and it is believed that the threatening invasion of the wire wheel, and all it implies, should suffice for the impetus.

* * *

RECOUNTING the incidents and cost of a long tour opens in THE AUTOMOBILE this week. This character of information has been extremely difficult to obtain bereft of trade cant, but in this case the incidents of the tour were very carefully recorded log fashion and the final summing up of the cost will be good information for the new automobilist who may be too much inclined to the belief that touring is a one-sided affair, with pleasure holding the center of the stage. The real pith of the matter is that touring, under well-regulated conditions, with a studied itinerary, provision for the cost, and a proper outfit, holds no equal in the field of recreation. It is a great mistake, however, to mar the pleasures of a tour through a short-sighted disregard of the simple expedients which even a journey on a railroad train would naturally suggest.

* * *

THIS year seems to be the most promising for the introduction of commercial (freight) automobiles. The several plants throughout the country are giving this part of the industry more and better attention than formerly and the users of freight automobiles are intelligently receptive now. The second week at the Garden Show should prove most interesting to makers and users alike.

News Section

HAPPENINGS OF THE WEEK IN VARIOUS SECTIONS OF THE COUNTRY AS GATHERED BY THE 84 SPECIAL WRITERS AND CORRESPONDENTS OF "THE AUTOMOBILE"

Selden Patent case on hearing in United States Circuit Court of Appeals—Arguments will be concluded on Friday—News of the coming automobile shows—A. L. A. M. announces list of freight truck exhibits for second week of Garden show—Special article on Olympia show in London—W. H. Cameron says British makers use unnecessary labor—Motor Club of Harrisburg conducts its autumn endurance run—New York Automobile Trade Association has many entries for its coming two-day run—Briscoe will make and sell "Utility" cars in England—Peeps through auto goggles at distant lands—Other snappy news from all around.

Curtain Rises on Last Scene of Selden Fight

WITH impressive pomp and circumstance the curtain has risen upon what may prove the final scene of the long-drawn-out Selden Patent litigation. The stage is set in the Federal Circuit Court of Appeals and the full bench, consisting of the venerable judges, McComb, Ward and Noyes, are hearing argument *pro* and *con* with regard to the most momentous question ever raised in the history of motordom.

Both sides are represented by eminent counsel and the court room at each session is filled with interested audiences.

The status of the matter is as follows: Appeal was perfected by the Ford Motor Company and others from the decision of District Judge Hough, who upheld the Selden Patent and granted an injunction against them.

The patents involved are those covering the gasoline engine and its chief auxiliary elements as applied to locomotion on the roads. The complainants originally were George B. Selden and the Electric Vehicle Company, and later the Columbia Motor Car Company succeeded to the rights of the Electric Vehicle Company. The A. L. A. M. is interested through its administration of the licensing power conveyed to it through the other parties in interest.

A decision sustaining Judge Hough's ruling would mean a readjustment of motordom to meet the new condition. An adverse decision would prove even more radical in its effects, as it would lift the present restrictions from the motor-making trade.

Henry Ford, president of the Ford company, a battler of the first rank, is attending every session, as are attorneys representing many of the independent organizations and corporations. On the other hand, the A. L. A. M. is represented by a battery of legal talent, and Alfred Reeves and a number of other officers are watching each step in the proceedings with intense interest.

The proceedings were opened by Livingston Gifford on behalf of the appellant Ford company. His argument dealt chiefly with the facts, leaving the discussion of the law principally to the closing argument of Edmund Wetmore.

In Mr. Gifford's argument he traced the history of the automobile, beginning with steam vehicles in England prior to the introduction of the railroad and carried it down to the time of Selden's application for patents. He referred to delays in the patent extending from 1889 to 1895 and then continued with the history of the development of the modern automobile. He particularly referred to the exhibition of a Benz car at the Paris Exposition of 1893 and continued up to the present. He spoke in detail of the contributions to the art by Daimler, Ford, Duryea and Maxwell.

Taking another line, his argument went into the history of hydro-carbon gas engines, commencing with Lenoir in 1861; Brayton in 1872; Otto in 1876, and subsequent developments of them.

His deductions from his array of facts were that Selden had contributed nothing to the art; that the Selden vehicle was wrong in every particular, including his wagon, his engine and his combination of wagon and engine. Finally Mr. Gifford concluded that the Selden patent was invalid in toto; that nobody had ever infringed it and that Selden himself had never built a vehicle or an engine that would run.

At the opening Tuesday morning, Samuel R. Betts, for the appellees, opened the other side of the argument. Mr. Betts treated of the case generally, upholding the Selden device at every point where Mr. Gifford had assailed it. He asserted that the patent was valid and that courts had so adjudicated it. He was followed by William A. Redding, who took up the facts involved in the case. He pointed out the fact that there were no automobiles in use prior to the Selden patent and made an emphatic point that no patents are on file covering the subject matter that antedate those of George B. Selden.

Time for adjournment cut off Mr. Redding's address and it will be continued Wednesday morning.

Following him will come Frederick P. Fish, a noted orator, who will complete the case of the A. L. A. M., treating upon the law of the action.

Edmund Wetmore will conclude for the Ford company, except for an address by Frederic Coudert, who has been representing the Panhard interests.

It was found that the case could not be finished by Wednesday night and two hours will be allowed the attorneys on both sides to wind up the presentation, on Friday.

Already the attorneys are figuring upon the future of the litigation. In case the patents are overturned the case may go to the Supreme Court of the United States under the same procedure that obtained in the Carnegie case. On the other hand, if the decision of the lower court is sustained, the attorneys for the appellants figure that a certificate of importance will be sufficient to take the case to the highest court.

Both sides express the utmost confidence in the merits of their cases, but neither principals nor attorneys would express any opinion as to the outcome.

Throughout the arguments, the judges were attentively interested and numerous pertinent queries were directed at attorneys for both sides from the bench. Judge McComb particularly questioned Mr. Betts on several points made by the lawyer. This single fact seemed to enliven the opposing attorneys. On the other hand Mr. Gifford had to answer numerous queries while he was addressing the court.

A decision of the case is not expected immediately and may be delayed in regular order for several weeks.

News Notes of the Coming Automobile Shows

AUTOMOBILE exhibitions are now the foremost element of interest in motordom. Shows of every kind, ranging from those of national scope to local exhibitions of a few styles and makes, are in the process of making. Every center of motoring is preparing for its show and as a result there is a stirring and activity of interest wherever two or three live dealers are gathered together.

Preparations for the New York shows are moving along steadily and while nothing radical with regard to them has developed during the past week, distinct progress has been made.

In the coming A. L. A. M. show at Madison Square Garden the announcement is made that the following cars that have never been shown at a licensed exhibition will be displayed:

Marmon, Reo, Maxwell, Overland, Premier, Mitchell, National, Jackson, Brush, Regal, Stoddard-Dayton, Hupmobile, Midland, Moline, Moon, Oakland, Ohio, Pullman, Speedwell, American, Amplex, Atlas, Cartercar, Case, Chadwick, Inter-State, Kissel, Buckeye, McIntyre, Marion, Courier, Morgan, Garford, Mack, Rapid, Reliance and Grabowsky.

The above are in addition to the old members of the Association of Licensed Automobile Manufacturers and the importers, the total number of car exhibitors for the big show being 68.

A.M.C.M.E.A. List Includes 61 Makers

Two more motor car manufacturers were signed up for space in the Palace show during the past week. These are: The De Tamble Motor Co., of Anderson, Ind., and the L. M. Hartman Sales Agency, of York, Pa., which handles the Hart Kraft truck.

The Chase Motor Truck Company will have a full line displayed at this show, as will also the Henry Motor Car Sales Co. The list now contains the names of 61 concerns that may be classed as manufacturers or special representatives of the makers.

Dealers and Club Clash in Milwaukee

MILWAUKEE, Nov. 21—The motor show situation in Milwaukee, Wis., has taken a serious turn and the split between the Milwaukee Automobile Club and the dealers, which threatened to weaken the second annual club show last February, has been made complete. The dealers now have organized a permanent association and at a meeting last week decided to hold the first annual show during the week beginning January 15, 1911.

The club, as usual, had planned to hold its third show during the week following the Chicago show, or February 12. The club has an option on the Auditorium for this period, while the dealers' association has contracted for the use of the building during the week of January 15.

At a special meeting of the Milwaukee Automobile Club, on November 18, a committee was appointed to confer with the dealers' association with the idea of combining the two shows. It is known that it would be ill advised to have two shows in Milwaukee.

The dealers' association is proceeding with its plans and has appointed Bart J. Ruddle as general manager of the show. The show committee consists of Frank J. Edwards, manager of the Kissel Kar Co.; Emil Estberg; R. G. Bates, of the Bates-Odenbrett Automobile Co.; Waldemar Kopmeier, of the Kopmeier Motor Car Co., and Edgar F. Sanger, of the E. F. Sanger Co.

Applications for space have been made by the following named dealers, all members of the association:

American Automobile Co., Pierce-Arrow; Bates-Odenbrett Automobile Co., Winton, Overland, Marion and Marmon; Curtis Auto Co., Reo and Corbin; Emil Estberg, Pope-Hartford and Woods and Waverley electrics; Franklyn Auto & Supply Co., Franklin and Babcock electrics; Hickman-Lauson-Diener Co., Ford; Jonas Automobile Co., Peerless and Cadillac; Johnson-Burnham Sales Co., Interstate; Kopmeier Motor Car Co., Detroit electric and Chalmers; Kissel Kar Co., Kissel; Rambler Garage Co., Rambler; Studebaker Automobile Co., Studebaker, E-M-F and Flanders; Albert Smith, Palmer-Singer; Edgar F. Sanger Co., Stearns, Maxwell and Columbia; Welch Bros. Motor Car Co., Packard and Rauch & Lang electric.

Clifford E. Golder has been elected president of the Milwaukee Dealers' Association. Other officers are: Secretary, H. B. Pruden; treasurer, August A. Jonas.

Newark Show Dates Are Selected

NEWARK, N. J., Nov. 21—Dates for the Newark automobile show have been fixed for the week of February 18-25, and the New Jersey Automobile Exhibition Company is now busy trying to find a suitable hall. Former shows have been held in the Sussex County armory, but as the indications point to a much larger list of exhibitors than ever before, it is thought the armory would prove too small. The company is considering the First Regiment armory. The show has the support of the New Jersey Trade Association and the Associated Automobile Club of New Jersey.

Big Show Promised in Boston

BOSTON, Mass., Nov. 21—The ninth annual automobile show will be held in this city from March 4 to 11, and already the Boston Automobile Dealers' Association is confronted with the problem of supplying space for all those who wish to exhibit. A plan to limit the amount of space to be allotted is under consideration. A corps of architects and engineers has surveyed Mechanics building and it is thought that considerable additions to the available space can be made by slight alterations.

Electric Division Quaker Feature

PHILADELPHIA, Pa., Nov. 21—One of the features of the Philadelphia Automobile Show this year, which is scheduled for the Third Regiment armory the two weeks of February 14-28, will be the display of electrics. Among the cars that will be shown in this division are: Woods, Rauch & Lang, Baker, Babcock, Studebaker, Columbia, Detroit and Waverley.

Columbus Club May Abandon Show

COLUMBUS, O., Nov. 21—At a meeting of the board of governors of the Columbus Automobile Club it was decided to abandon the proposed automobile show unless a suitable hall can be secured, nearer to the heart of the city than the Ohio State Fair Grounds. The committee to secure a site for the show failed to report much progress.

Chauffeurs' Strike Still Critical

"Closed Shop" and no quarter is the demand of the striking chauffeurs in New York, and a settlement of the strike seems as far away as ever. The Motor Cab Owners' Association has issued a statement that the difficulty is about over, and while the taxis are moving with a trifle more freedom than heretofore with the aid of the police, the strike is still on.

A meeting of the strikers was held Sunday night, at which resolutions were passed to continue the strike to a conclusion. As we go to press every taxicab on the street is "riding" a policeman and of "fares" there are none at all.

Fifty Per Cent. of Clean Scores in Harrisburg Club Run

HARRISBURG, PA., Nov. 21—The fall endurance run of the Motor Club of Harrisburg started to-day with an entry list of 22 cars. To-day's run was 170 miles through York, Hanover, Hagerstown, Chambersburg and back to Harrisburg. The entries are classified in four divisions from 3A to 6A, which means that they are strictly stock cars valued at from $1201 to $4000 each. The list of entries includes:

DIVISION 3A—$1,201 TO $1,600

Car	Entrant	Driver
Crawford	Crawford Auto Co.	A. A. Miller
Reo	Harrisburg Auto Co.	G. G. McFarland
Everitt	W. Wayne Davis Co.	Davis
	Runabouts	
Maxwell	And. Redmond	Redmond
Firestone-Columbus	Seltzer & McCowen	Rasmussen
KlineKar	Ideal M. C. Co.	Vandergrift
Warren-Detroit	Taylor Mot. Dis. Co.	Kinginger

DIVISION 4A—$1,601-$2,000

Inter-State	Cent. Pa. Auto Co.	I. W. Dill
Velie	Zimmerman M. C. Co.	P. W. Walker
Maxwell	A. Redmond	H. E. Walls
Velie	Rockefeller and By'y	Rockefeller
Kline	B. C. K. M. C. Co.	Fletcher
Pullman	Keystone M. C. Co.	Brown

DIVISION 5A—$2,001-$3,000

Pullman	Pullman M. C. Co.	Steins
Pullman	Pullman M. C. Co.	Gallatin
Kline	B. C. K. M. C. Co.	C. C. Fairman
	Runabouts	
Kline	B. C. K. M. C. Co.	Seig
Pullman	Keystone M. C. Co.	Jones

DIVISION 6A—$3,001-$4,000

Columbia	A. Redmond	Smith
Matheson	Ideal M. C. Co.	Hall
	Runabouts	
Pullman	Pullman M. C. Co.	Welker
Kline	B. C. K. M. C. Co.	Kline

HARRISBURG, PA., Nov. 22—Eleven out of the 21 starters in the two-day run of the Motor Club of Harrisburg came through yesterday's trial with clean road scores. Three Klines were penalized; a Maxwell had oiler troubles and was withdrawn, while another drew a penalty for work on the road. The Firestone-Columbus turned turtle and the Inter-State entry met with a bad accident caused by skidding. One of the Crawfords broke an axle. A Velie car was penalized 21 points for lateness at control.

The run to-day is over a route that is quite as trying as yesterday's, with more and stiffer hills to climb. Tire troubles were much in evidence yesterday.

Two Thanksgiving Day Race Meetings

Thanksgiving Day will be celebrated by two race meetings within a short distance from New York. O. D. Corbett, who is secretary of the Automobile Club of Hudson County, is head of an enterprise to hold a race program at the old Guttenburg race track. This meeting has attracted a large list of entries and is sanctioned by the Contest Board.

The other meeting will be held at the track of the Bridgetown, N. J., Driving Association, under the auspices of the newly formed South Jersey Motor Club. Harvey Ringler is one of the promoters of this meet.

Aviation Meetings Present and to Come

PHILADELPHIA, Nov. 21—Aviation has succeeded the other important things in life as the most interesting phase of existence in Philadelphia this week. The flyers started last week at Point Breeze, and the Quaker City has acquired a crick in the neck from looking upward to see if a stray machine or two might not be hovering over the town.

A big section of the population was rewarded by seeing Grahame-White swoop across the navy yard, flying in a Farman close to the latticed fighting masts of the anchored battleships, and other feature flights have attracted attention. The meeting will continue until Friday.

HAVANA, CUBA, Nov. 21—John B. Moisant, winner of the Statue of Liberty flight in New York recently, and an aggregation of flying talent will show in Havana during the coming season. It is announced that Mr. Moisant's company will consist of half a dozen prominent airmen.

Racers Ready for Santa Monica Trial

LOS ANGELES, Nov. 21—Eight racing cars, entered for the annual Santa Monica road race, are being sent along at speed over the smooth 8.4-mile course in preparation for the big event which is scheduled for Thanksgiving day. The entries so far include: Apperson, Fiat, Isotta, Pope-Hartford, Lozier, Knox, Ohio and Only Car. It is predicted by the drivers that last year's record of 64.45 miles an hour will be excelled. The race is 24 laps of the course. A light-car race and a stock-car race will precede the main event. Both are fairly well filled.

Through an error in THE AUTOMOBILE's account of the recent electric run promoted by the Philadelphia *North American* it was made to appear that the second-prize-winning Studebaker car was a Waverley. The car was splendidly driven by Mrs. E. V. Stratton, wife of the Studebaker manager in Philadelphia.

Naphtha Given Service Test on Road

CHICAGO, Nov. 21—Benzine as motor fuel was given a test last week under the direction of the Chicago Motor Club. The Falcar that tied with two Molines with perfect score in the recent 1,000-mile reliability run, equipped with a Rayfield carbureter, was used in the test.

The tanks of the car were drained and filled with naphtha, commercially known as benzine, testing .55 specific gravity at 40 degrees Fahrenheit. A gallon of pure lubricating oil was put into the crankcase reservoir.

Starting from Van Dyke's garage last Thursday the car was run 670 miles to Cincinnati and return by way of Indianapolis and Lafayette. The average running time was 22 miles an hour and the total fuel consumption was 36 gallons, an average of 18.6 miles a gallon. Oil was taken on at Cincinnati and at Indianapolis on the return trip.

No motor trouble was reported except difficulty in starting on the final leg of the trip after the car had stood all night in a cold garage. Then it required priming with gasoline several times before it would start. The car weighed 3,600 pounds with three passengers.

Benzine test on a Fal-Car fitted with a Rayfield carbureter made to determine the feasibility of using heavy hydrocarbon fuel instead of gasoline proper

Big Crowds Attend Olympia Show

LONDON, Nov. 10—Wonderful, indeed, is the London Olympia Show, both as regards number of cars exhibited and attendance of visitors. At the moment of writing, right in the middle of the week, the official figures of those passing the turnstiles on the first four days is 102,200. The regular price of admission for six of the days is 24 cents from 10 a. m. to 10 p. m., continuously; on one day it is $1.25 and on one day 60 cents, and even on the highest priced day 16,000 persons put their money down at the turnstiles.

There are in the building a total of 589 cars and polished chassis (8 less than were seen at the last Olympia show) made up of 294 British, 185 French, 29 German, 28 Italian, 25 Belgium, 18 United States, 7 Swiss and 3 Austrian. The total number of exhibitors of all kinds being 298.

The first inspection gave an impression that there was little alteration from last season's models on the polished chassis and it was only by carefully examining the details that one could learn of the real changes effected in the engine and transmission. There is no likelihood of any maker in England standardizing in large quantity which has so materially aided in the success of several well-known United States cars.

The extent to which the wire wheel is now used can be realized from the statement that all the leading British car makers fit these as their regular pattern and almost all of them will only fit wood wheels to special order and will not promise any time for delivery.

One English maker who catalogued a four-cylinder block casting during 1910 has reverted to single-cylinder casting and this is about the only exception that can be discovered on the increasing use of the block casting for engines up to about 80 millimeters diameter. For the first time at any show a six-cylinder block casting is displayed by a French maker and the Fiat Company has something on the same lines; both engines rate at 24 horsepower.

As regards number of cylinders, the four holds 95 per cent. of the trade, only four English makers turning out a single-cylinder engine and not more than half a dozen make the two cylinder. The six cylinder, hitherto thought too costly for other than large cars, is being introduced for as small as 15 horsepower by the Delauney-Belleville and slightly larger engines by some dozen companies, hardly any exceeding 24 horsepower.

The big valves talked about last show time is still upon paper and whilst sizes are fractionally increased, more attention has been devoted to cam profiles, silencing of the tappet rods, reducing strength of valve springs to a minimum and completely guarding springs and valve stems against dirt by enclosing with oil-tight covers.

Good roads memorial to be erected in honor of Colonel Pope

One English firm stands by the overhead valve, both for inlet and exhaust, Darracqs show overhead valves on their new model 15 horsepower and a Belgium house introduces similar valves driven by an enclosed chain from the tail end of the engine. Engine noises are decreasing, the timing gears coming in for much attention from designers, helical or skew wheels making an otherwise noisy engine quiet.

The ratio of bore to stroke, taking an average through quite a long list of cars, is 1 to 1 1-4, although a French house is intending to sell a chassis with the ratio of 1 to 2, viz., 80-mm. bore and 160-mm. stroke. Practicable limits of compression have been reached and 80 lbs. to the square inch is the standard. Piston speed is increasing and how many revolutions a minute will be reached only a year hence, no one would care to predict. To give an idea of what English designers are trying for in this direction, it may be remarked that a week before these words were written a four-cylinder Vauxhall, 90-mm. bore by 130-mm. stroke was driven for a flying half mile on Brooklands track at the officially certified speed of 100.08 miles per hour and this same car is capable of over 90 m.p.h. for a ten-mile spin.

Oiling systems for moderate-priced cars, selling complete for $1,000, have an oil pump in the crank chamber.

Small air pumps for raising and maintaining pressure in gasoline tanks are regular features of nearly all the new models, these air pumps receiving motion from the camshaft.

On moderate powered and small cars, say below 26-30 horsepower, thermo-syphon circulation is on 75 per cent.

In connection with the water circulating system some makers are prepared to install devices for heating the interiors of limousine and landaulet bodied cars.

"Silent" Knight Inventor Coming

Charles Y. Knight, inventor of the "Silent" Knight motor, which has found immense favor abroad, is en route for America. Mr. Knight is expected to arrive in New York the last of this week. He is a native American, although his residence is in Coventry, England, where his extensive business is located.

His trip to the United States at this time will arouse much speculation as to its significance. It is understood that several American manufacturers have been negotiating with Mr. Knight.

Delay in 1911 Model Announcements

Almost at the opening of the current year it seemed as if many of the big automobile manufacturers of America would announce their lines for the coming year long before the business of 1910 had been finished.

There are several of good reasons why undue haste should not be used in making announcements of this character, and the trade is to be congratulated that a number of makers have restrained, even thus far, from prematurity in this regard. Prominent among the concerns which have shown a high degree of conservatism in this particular are the Pierce and others, which concerns probably will not make the annual announcements until just before show time, or even at the show.

Pope Memorial as Tribute for Road Work

HARTFORD, Nov. 21—As a tribute to the work for good roads done by the late Colonel Albert A. Pope, of Boston, a movement which was started a short time after his death to collect funds and build a memorial to Colonel Pope in Hartford, Conn., promises to be successful. The memorial will be placed in Pope Park, which Colonel Pope presented to the city of Hartford.

The Hartford Board of Trade has been collecting money and working to interest the users of the roads in the movement, and the announcement is made that nearly $4,500 has been realized. It is proposed to erect a handsome drinking fountain to cost about $7,500.

"Good Cars, but Labor Is Wasted," Comments Cameron

LONDON, Nov. 12—W. H. Cameron, chief engineer of the Willys-Overland Company, who is now abroad on a tour of investigation of various automobile plants, was interviewed exclusively for THE AUTOMOBILE during his visit to England. Mr. Cameron had nothing to say about the foreign plans of the Overland company, but he did make some interesting comments on British motor car manufacture after personal inspection of several plants and visiting the Olympia show.

"I am struck with the amount of unnecessary work done on many of the British cars," said Mr. Cameron, "and I believe that the education of the automobile-buying public in England has been given a wrong turn by reason of it. In my opinion too much stress is laid upon finishing. It seems to me that a saving could be made by abandoning the practice of machining up the throw of crankshafts and similar parts.

"This extra and unnecessary labor must add to the cost of the car without increasing its value, which, naturally, makes the finished product unduly expensive. The workmanship on English-made automobiles is equal to the best anywhere."

While Mr. Cameron was in France he met with some difficulty in inspecting the motor-car plants on account of the attitude of the French makers with regard to visiting engineers. He is about to leave for Italy and expects to return to America in three weeks.

Receiver for Barnes Motor Co.

DETROIT, MICH., Nov. 21—The long expected crisis in the affairs of the Barnes Motor Co., formerly the Anhut Motor Car Co., came Tuesday last, when Frank Howard, of this city, on behalf of a number of creditors, filed a petition in the United States District Court here, asking that the concern be declared bankrupt. Following the formal order of adjudication, William M. Walker, president of the company, was appointed receiver with a bond of $15,000.

The schedules place the total liabilities at $64,242.33 and the assets at $143,540.25. Many of the latter are of a doubtful character, however, and the creditors will not realize anywhere near the full amount of their claims.

The bankruptcy proceedings were forecasted by Mr. Walker more than a week ago, when about $14,000 was distributed among the creditors through the Union Trust Co.

Among the principal creditors are: The Peninsular Savings bank, Detroit, $4,000; American Ball Bearing Co., Cleveland, $3,697.40; Anhut-Robinson Auto Sales Co., Detroit, $1,960; R. C. Day, Toledo, $1,648; R. C. Durant, son of W. C. Durant, of the General Motors, $2,812; Fez Auto Sales Co., Chicago, $2,500; Griswold Motor & Body Co., $6,245; N. B. O'Connor, $3,000.

Assets include auto parts, machinery and partly completed motor cars in the plant at No. 510 Howard street, on which a valuation of $21,500 is placed; a factory and real estate in Chatham, Ont., valued at $50,000; $2,116 due the company in notes, and $26,571.23 in open accounts, but included in the latter item is about $20,000 in fire insurance policies.

Gaeth Assets Sold to Stuyvesant Co.

CLEVELAND, Nov. 21—The Stuyvesant Motor Car Co. has purchased the assets of the Gaeth Automobile Co., which recently went into the hands of a receiver. The Stuyvesant Co. is now building a 6-cylinder car called the Stuyvesant and has a large factory at Sandusky, covering 150,000 square feet of floor space.

The Gaeth plant will be removed to Sandusky and the company will continue to build the Gaeth model. It is the intention to build 200 4-cylinder Gaeths and 100 Stuyvesant Six models for 1911. The board of directors of the Stuyvesant Co. are F. E. Stuyvesant, for a number of years with the White Co., A. H. Frunfelder, A. C. Newton, and C. J. Castle.

Matheson Reorganization Perfected

WILKES-BARRE, Pa., Nov. 21—Under a rule of the Court of Common Pleas of Luzerne County, the assets of the Matheson Motor Car Company have been ordered transferred to the Matheson Automobile Company. The order was directed to Asher Miner and W. C. Shepherd, receivers of the manufacturing company and required them to turn over the property, franchises and rights to the New York concern.

Under the plan of reorganization the following directors have been named for the Matheson Automobile Company: W. C. Shepherd, J. W. Hollenback, Asher Miner, W. H. Conyngham, John A. Turner, W. H. Son, John C. Bridgman, R. N. Bennett, I. M. Thomas, C. W. Matheson, M. M. O'Boyle, Henry Hess, E. S. Fretz, J. B. Russell and Cortez Jennings. The capitalization of the new company has been increased by $700,000, making the security issues total $1,100,000 plus a new bond issue of $300,000. On the face of the situation the company is now in much better financial shape than ever in its history.

The wholesale sales department has been transferred to Wilkes-Barre, and the New York salesrooms and other departments will be operated as a retail branch. The company will confine itself to the manufacture of its Big Four and Silent Six exclusively. W. C. Shepherd is president and general manager.

American Invasion Will Become a Reality

If the English persist in over-finishing the cars made there.
If unnecessary labor is thrown promiscuously into English cars.
If French makers continue to hide behind a Chinese wall.

Bretz Company Takes Larger Quarters

Changing from its location in the Times building, the J. S. Bretz Company, which handles a number of imported accessories, has secured the whole of the sixth floor of the Motor Hall, 250 West Fifty-fourth street.

Clubman Proves Ability as Race Manager

Otto F. Rost, who was active in conducting the race meeting of the Mt. Vernon Automobile Club at the Empire City track November 12, accomplished quite a feat in making the meeting a success. It was postponed twice on account of bad weather, and the day finally selected to hold it was anything but favorable. Nevertheless, the paid attendance was sufficient to meet all expenses and the sport was interesting.

Mr. Rost is a native of Hamburg, Germany, and has been in the automobile business for about three years. He started as a salesman for the Black Manufacturing Company, of Chicago, and after one year was made New York manager of the Black Crow line.

Otto F. Rost, who promoted the recent Mt. Vernon Club Meet.

Two-Day Autumn Run Attracts Big Entry List

WITH an entry list including many more cars than were expected, the two-day endurance run under the auspices of the New York Automobile Trade Association, which will be held November 29 and 30, promises to be one of the most interesting affairs of its kind given about New York this season. The contest is restricted to stock cars under Class A rules.

There are seven divisions in Class A, ranging from under $800 to over $4,000, and sterling silver trophies will be provided for the winners in as many of the classes as fill. In addition to the trophies hung up by the association, a number of firms and corporations have signified their intention of furnishing trophies for the contest.

The first day's run starts at 8 o'clock Tuesday morning, November 29, from Columbus Circle. The route is through Stamford, Conn., via New Rochelle, Larchmont, Mamaroneck, Rye, Port Chester and Greenwich. Thence through Springfield, New Canaan and Ridgefield to Danbury, where noon control will be established, 62 miles from the start. Returning, the column will go through Mill Plains, Brewster, Carmel, Lake Mahopac, Baldwin Place, Briarcliff, Elmsford, Harts Corners and Greenville to New York. Checking stations will be established at Briarcliff, Danbury and Stamford, and, of course, at the start and finish. The total distance of the first day's run will be 136 miles.

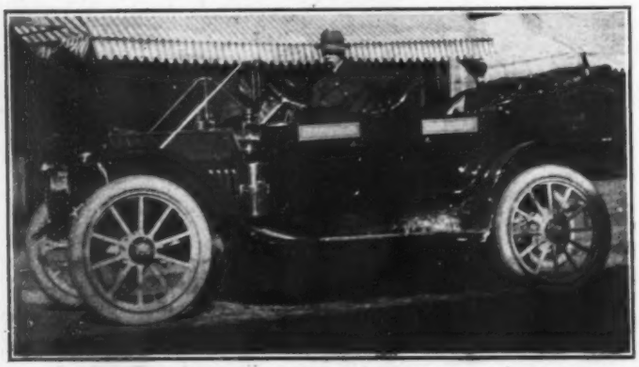
The final day will be through New Jersey. The cars will be checked out on the Jersey side of the Forty-second street ferry at 8 o'clock and will proceed through Hackensack, Suffern, Ramapo, Tuxedo, South Field, Vails Gate to Newburg, noon control. The return trip will be via Little Britain, Goshen, Chester, Munroe and South Field; thence following in reverse the route taken in the morning. Entries close tomorrow.

The list of entrants includes the following to date:

The B. F. Goodrich Co., of New York; Maxwell-Briscoe, Inc.; Mitchell Motor Co., of New York; The A. Elliott Ranney Co.; Pope-Hartford Auto Co.; Union Automobile Co.; Cimiotti Bros.; The Gordin Motor Vehicle Corporation, of New York; The Allen Auto Specialty Co.; Jackson Motor Co.; Poertner Motor Car Co.; Oldsmobile Co., of New York; Warner Inst. Co.; Carl H. Page & Co.; Pennsylvania Motor Car Co.; Short & Wright; Garland Automobile Co.; Atlantic Motor Co.; Chas. E. Reiss; R. M. Owen; The White Co.; Ford Motor Co.; Victor Auto Storage Co.; Haynes Automobile Co.; Stearns Motor Co.; Zust Motor Co.

Everitt "30" Shows Well Over the Hills

BOSTON, Nov. 21—J. E. Brown, of the J. W. Bowman Company, of this city, recently drove an Everitt "30" from Portland, Maine, to Concord, N. H., via York Beach and Dover, a distance of 108 miles, at an average speed of 20 miles an hour, using one gallon of gasoline for each 15 miles traveled over the heavy roads and stiff grades and did not suffer any tire trouble. Mr. Brown was accompanied on the trip by G. R. Lewis, of the *Engineering Review*.



Everitt "30" which recently made a creditable trans-Maine record

New Racers Will Speed at New Orleans

NEW ORLEANS, Nov. 21—The début of the Case car in racing will be made at the Mardi Gras speed carnival, which will be run off at the Fair Grounds race track February 25-27. This car was formerly known as the Pierce-Racine, but so far its part in contest work has been limited to a few reliability runs. The Cino will also make its bow. Entries have been made of several Cole "30s," Jacksons and Buicks.

Ohio Car Starts Across Continent

NEW YORK, Nov. 22—Starting from the ancient City Hall at noon Tuesday, an Ohio car took up the first leg of a run that has San Francisco as its terminus. It is planned to make 150 miles each day and to reach the Golden Gate on Christmas Day. An accurate record of gasoline and oil consumption will be kept throughout the trip.

The car, known as the "Mud Hen, is driven by Charles Thacher. E. L. Ferguson and Guy W. Finney are passengers.

R. E. Ross Resigns from Q. C. M. C.

PHILADELPHIA, PA., Nov. 21—Robert E. Ross, one of the most active members of the Quaker City Motor Club, and head of the contest committee of that organization, has resigned from the club. Mr. Ross ascribes as a cause for his action the pressure of private business. Recently the concern with which he is identified secured some large paving contracts in and about Philadelphia.

The annual election of the club is scheduled for November 30 and a full report of the recent Fairmount Park road race will be submitted. Some of the officers declare that the report may contain the real reason for the withdrawal of Mr. Ross.

Ray Harroun to Make Aeroplanes

INDIANAPOLIS, Nov. 21—The retirement of Ray Harroun as a driver of racing automobiles has been announced. Mr. Harroun has entered the field of manufacturing aeroplane engines and aeroplanes and will be seen no more in the yellow-jacketed Marmon racing cars. His appearance in the Grand Prix race was his final exhibition of that sort.

In racing Mr. Harroun has enjoyed a big measure of success, although engaged in it only a comparatively short time. He has been head of the racing team of the Marmon-Nordyke Company for a little over one year. He is a college-bred man and has a degree of M. E.

Military Automobile Arouses Interest

Recent editions of newspapers in different sections of the country contained an interesting article, quoting E. H. Barnum, New York branch manager of the Regal Motor Car Co., and a National Guard officer in his State, relative to the possibilities of the automobile in the army.

Mr. Barnum says that as a result of the article he has received many letters from inventors, would-be inventors and fanatics, making inquiries and soliciting his aid with a view of bringing forward to public attention inventions and proposed inventions of their creation. Mr. Barnum believes that there are tremendous possibilities for the automobile in the army.

Briscoe to Make and Market "Utility" Cars

LONDON, Nov. 5—Benjamin F. Briscoe, president of the United States Motor Company, who is now visiting England and Continental Europe for the purpose of founding the United International Motors, Limited, a company affiliated with the big American concern of which he is the head, has departed for Paris after a stay here of considerable length. The company was launched during his stay, although a site for the British factory has not yet been selected.

In speaking about the situation before leaving, Mr. Briscoe in an interview exclusively for THE AUTOMOBILE had the following to say:

"An examination of the motor situation in England shows the opportunity for the 'utility' car. By 'utility' car I do not mean an automobile limited to the carrying of freight, but such a car as will lend itself to the use of physicians, contractors, salesmen, farmers and other persons who are now using horse-drawn vehicles for personal transportation in their callings. In fact, the field might be extended to many who do not feel that they can afford a horse and buggy in business, but who could easily afford a small car that would have a much wider range of usefulness than the horse.

"Such a car, to cost from $575 to $1,500, would find a ready market not only in England, but upon the Continent as well, in my opinion, and the production of such types will be the mission of the United International Motors, Limited. From my personal observation there is a dearth of such cars in England.

"Careful investigation of the motor conditions here shows that the total production of motor cars in England amounts to about 12,000 or 14,000 annually. In addition there are some 7,000 imported each year. I believe that cars such as we propose to build here, with all the advantage that we have of a strong technical staff of engineers connected with our American factories and the cumulative experience they have had in construction work and experimentation, will fill a gap of considerable proportions.

"We have been looking for a suitable site for the erection of our first factory in England, but have not definitely fixed upon it. It appears to me that many of the automobile factories are not scientifically located as regards transportation, labor and other important particulars. We wish to secure the most available site possible and will be very careful in selecting it.

"I believe that motor cars can be manufactured in England at less expense than they can in the United States, particularly with the aid of our engineers and their staffs now engaged in America, utilizing English labor and material."

Upon leaving London Mr. Briscoe went to Paris and from there he will go to Berlin with the idea of arranging branches of United International Motors. He will return to England before sailing for home.

The plans of Mr. Briscoe and those associated with him have attracted much attention in England, and as a general thing it may be said that the establishment of the factory will be welcomed by the British public.

Reno Valveless Motor Interests France

PARIS, Nov. 14—Europe has plenty of valveless motors, but very few besides the Knight that have given satisfactory results under working conditions. There is an exception in the Reno, a slide valve motor of French origin, just placed on the market by Hart O. Berg.

The cylinders of the Reno have two circular ports; the upper one is for the intake, the lower one for the exhaust. Within the cylinders is a split ring—a compression ring—with a face depth of about 1 1-2 inches. This depth is sufficient for the ring to cover both ports, thus giving a compression-tight chamber. When the ring is moved upward it uncovers the exhaust port; when brought downward it uncovers the intake and at the same time closes the exhaust port. The main idea is remarkably simple, and the adoption of this principle results in a reduction in the number of parts required for the motor, with, contrary to the generality of slide valve motors, a considerable reduction in manufacturing cost.

For accessibility and ease of upkeep the motor compares well with the poppet valve type.

Lubrication has been provided for by means of an oil pump worked off the camshaft, which delivers oil to the four rocker arms, which are encased with their actuating rods. The supply of oil is carried along the rocker arm to the ball and socket at the inner end, a sufficient quantity passes through to the walls of the compression ring, and the surplus flows down the outside of the cylinder and within the push rod housing to a hole in the base of the cylinder through which it flows onto the connecting rod. Crankshaft bearings and cylinders are lubricated by splash.

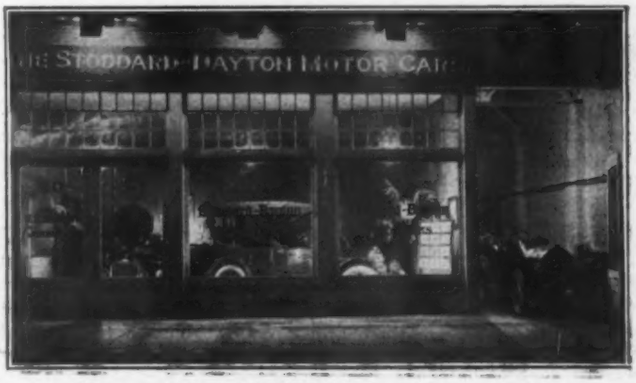
So far as can be judged from road tests, it has the advantage of big valve area, ensuring complete filling of the cylinder and a quick and complete scavenging. At the same time the large valve area is secured without the enlargement of the combustion chamber and the loss of efficiency through the formation of pockets. The split rings have been found to retain compression as well as poppet valves in the best condition. On the bench the motor develops 28 horsepower at 1,350 revolutions, which is found to be its most efficient speed. It can be accelerated up to 2,200 revolutions a minute.

Congressmen Campaigned in Stoddard

DENVER, COL., Nov. 21—Congressman G. M. Hitchcock, candidate for the United States Senate, and Congressman Latta, candidate for re-election at the recent election, made a tour of certain portions of Colorado during the campaign that is as unique in politics as it is in motoring.

In a Stoddard-Dayton car, driven by a son of Mr. Latta, the two politicians made a trip of over 1,000 miles through the mountains and deserts in nine days, making from seven to a dozen speeches each day. The actual running speed of the car was about twenty miles an hour over going that would be hard to equal anywhere. One whole day was consumed on roads that ran across typical Colorado sand ridges, a terror to motorists.

The car made the trip without mechanical trouble and only a small amount of tire difficulty was experienced. Other candidates have used the automobile in making their canvasses, but the tour of Messrs. Hitchcock and Latta is probably a record of its kind. The accompanying picture shows the Colorado home of the Stoddard-Dayton.



Home of the Stoddard-Dayton in Denver—at night

Peeps Through Auto Goggles at Distant Lands

IN the City of Jerusalem there are but two automobiles. Like Jerusalem, like Palestine. It may be many years before the automobile becomes a popular vehicle, even for purposes of pleasure, in Palestine. But there is a plausible reason for the holding back of improvements in the way of locomotion. The trouble is with the roads. It is doubtful if much worse roads exist in any part of the so-called civilized world. Up to this time, there has been but one tourist who has had the bravery to attempt to thread the roads of Palestine with an automobile.

From Ceylon comes the news that the taxicab has to a certain degree found favor. Bombay and Calcutta have taken their place among the modern cities of the world in the matter of calling for up-to-date methods of locomotion. Cars to the number of sixty are to be introduced at once into these cities, a company having been organized with a view to the undertaking. Cab hire is at the rate of 16 cents a mile.

There has yet to be seen an automobile upon the streets of Sandakan, the capital of British North Borneo. It has 6,000 or 7,000 inhabitants and is situated on Sandakan Bay. The Chinese town is on the flat, near the sea. The European bungalows are principally on the hills at the back of the town. Sandakan Harbor runs inland 17 miles. There is limited opportunity for automobiles just within and around the town. It takes from four days to a month to reach the interior, formerly called the "head-hunting country"; but now gradually giving way to industries, and especially in the Para rubber line. Later reports from there say that the plantations devoted to rubber-raising are doing well.

Until within a few years, transportation in Portuguese East Africa by means of the automobile seemed a question of wild speculation. But quite recently conditions changed materially for the better. Formerly, there were only "rivers of sand" in this portion of the world. In Lourenço, which is the capital of the province, an automobile appeared upon the street recently. It was the first ever seen there. The automobile in question is of the pattern which sells in America for $750, or thereabouts. By the time that the middleman and the tariff each had their bit out of the deal, the automobile stood the purchaser $1,400. Since the day that this machine made its appearance, four other automobiles have been put into active service in Lourenço. The streets of the town have just been paved with stones brought 50 miles by rail from the borders of the Transvaal, and they are now in excellent condition for automobiling. There is a market here for a limited number of cheap-grade automobiles.

Within the reef district in Johannesburg there are at least 1,000 motor cars in practical use. This number includes about 60 taxicabs, of European make. The types of automobiles which seem to be particularly in demand are cars of from 16 to 28 horsepower. The prices which seem to be most favored are from $1,250 to $2,500.

In the hilly island of Porto Rico, where the roads were built originally for heavy traffic, and particularly for military service, with very slight regard for grades, there is now a demand for automobiles in excess of the supply. There are about 750 miles of splendid roads on the island. But the humidity of the climate is exceedingly hard on automobiles.

During the last fiscal year Canada imported 1,424 automobiles, their value being $1,732,215, of which $1,569,227 came from the United States. Canada manufactured and exported automobiles to the value of $405,011.

At Huddersfield, in the West Riding of Yorkshire, England, where the fox-hunt has for years been one of the glorious sports, the automobile is creeping in. There are already 539 machines of various makes in that city. Of the total number of automobiles in use in Great Britain, 90 per cent. are in England and Wales; although there are 20,000 machines in Ireland and Scotland.

There being but one small automobile factory in Denmark, practically all of the automobiles in service are imported. Small runabouts, costing $750, for use by professional men are seen in considerable numbers. There is a low import duty on automobiles—2.68 cents per 2.2 pounds.

One sees few small automobiles in Germany. The demand runs to touring cars. In Nuremberg gasoline costs 32 cents per gallon.

Owing to lack of facilities for repairing automobiles in Rio de Janeiro, Brazil, the field for American-made automobiles has not been encouraging.

There are 44,769 automobiles, with 569,276 horsepower, registered in France.

The Italian Minister of Public Works has granted licenses for the opening of 52 new automobile lines, whose total length represents 1,864 miles, for the transportation of passengers and small freight throughout the Kingdom. Three taxicabs were recently put into commission in Palermo. There never have been any American-made automobiles in Palermo.

There are only 22 motor cars in use in British Guiana, in addition to five motor busses, which are in operation in Georgetown. Of the 22 machines, 11 were manufactured in America. The streets of Georgetown are wide, and well built. The automobiles are used to a considerable extent to run the distance to the Bartica rubber belt, where there are a number of rubber plantations. Gasoline is quite expensive in British Guiana, the price being $3.60 per drum of ten gallons.

The roads in the vicinity of Nanking, China, are in exceptionally good condition for automobiling and there are many pleasant drives. But there are only two automobiles owned by residents, these being the property of Chinese.

In the Amazon River region the owners of the rubber plantations are pressing automobiles into service to some extent, for the purpose of running between the estates. But as the South Americans are slow to adopt modernisms, the enterprise is not gaining ground rapidly.

Foreign automobiles without an international passport may be admitted to Germany, provided the driver can present to the customs officials at the border, or to the appropriate officials in uniform, a certificate from the proper officials in the foreign country, or if the vehicle in question complies with the local requirements of the driver's own country.

A person making application to become the driver of a motor vehicle in Germany is obliged to present his birth certificate, together with an unmounted photograph of himself; and he must also submit a doctor's certificate relating to his physical condition, especially with reference to eyesight and hearing.

Personal and Trade Notes

MINNEAPOLIS, MINN., Nov. 21—A. N. Smith, sales manager for the Royal Automobile Company, returned from Redfield, S. D., Saturday, where he closed with the Redfield Motor Car Company for the State agency on Abbott-Detroit cars. The deal involved the placing of 50 cars of this make on the initial order.

CHICAGO, Nov. 21—F. W. Eisele, who has been acting as a special factory representative of the Stromberg Motor Devices Company during the last year, has been appointed Ohio and Indiana manager, and will open up branch offices at Indianapolis.

DETROIT, MICH., Nov. 21—C. E. Gordon, formerly vice-president of the Western Malleable Iron Company, has joined the sales staff of the Timken-Detroit Axle Company.

CINCINNATI, O., Nov. 21—B. F. Gramm, vice-president and general manager of the Gramm Motor Truck & Car Company, which is completing a $300,000 factory at Lima, O., states that the concern will start off in January with a working force of 400 men. F. E. Castle, of the Castle Lamp Company, has removed from

Detroit to New York, and the New York offices of the Castle Lamp Company will be opened in the Fitzgerald Building, Forty-third street and Broadway.

FARGO, N. D., Nov. 21—This city has been selected as the location of the twenty-fifth branch house for the Ford Motor Company. The territory covered comprises North and South Dakota, and will be in charge of C. F. Reynolds, formerly with the Ford branch at Chicago.

NEWARK, Nov. 21—On the opening day of the next State Legislature, the New Jersey Automobile and Motor Club will present a bill remedying the present defects in the motor vehicle law. This bill is now being whipped into shape by the Legal Committee of the club, of which Vice-President Harry D. Bowman is chairman.

BOSTON, Nov. 21—The salesrooms of the Cole "30" in Boston are now located with the other motor agencies on Massachusetts avenue, the G. E. and H. J. Habich Co. having moved from Berkeley street last week.

BOSTON, Nov. 21—Fred P. O'Brien of the J. W. Maguire Co., Boston, agents for the Pierce-Arrow, was married last week to Miss Mary Elizabeth Mullins, of Cambridge. They went West on their wedding tour.

BOSTON, Nov. 21—John I. Taylor, owner of the Boston American baseball club, has embarked in the motor business with a company known as the Taylor Motor Sales Company, of which he is president. The company has taken on the Herreshoff for a start, but later on will take also a larger car and a commercial vehicle.

ST. LOUIS, Nov. 21—The new branch house of the Hartford Rubber Works Co. has been opened at the southwest corner of Nineteenth and Locust streets. O. O. Petty, until recently manager of the local Firestone branch, is manager. A well eqtuipped tire repair department has been made an important feature of the new business.

NEW YORK, Nov. 21—The Packard Motor Car Co. of New York has opened its new service building at Long Island City. The completion of this mammoth structure, after delays caused by quicksands, labor troubles, etc., marks another important step in the progress of the Packard Co.

NEW YORK, Nov. 21—Louis Mansbach, treasurer of the Times Square Automobile Co., has left on the 20th Century for an extended visit to their western branches at Chicago, St. Louis and Kansas City.

JACKSONVILLE, Nov. 21—The Glide Auto Co. of Florida has been formed to handle the Glide line for 1911. W. A. Jones will be manager of the new company, with headquarters in Jacksonville, where a new salesroom will be opened shortly.

PEORIA, Nov. 21—The Bartholomew Co. of Peoria, Ill., is rushing the work on two extensive additions at Peoria Heights.

WILMINGTON, DEL., Nov. 21—The Studebaker Automobile Co. has taken possession of its new building, 210 West Tenth street, where it has large and commodious quarters. The local agency is in charge of E. Gerry Brown. The Wilmington Automobile Co. has taken the local agency for the Lozier car, and during the past few days a representative of the company has been here demonstrating the machine. The West Side Garage, Inc., whose establishment is at Third and Connell streets, has taken the agency here for the Metz car. Andrew Johnson is the manager. Having taken the agency for the Hudson car, the Bradford Automobile Co. this week received a carload of 1911 models for local distribution.

BATAVIA, N. Y., Nov. 21—The Batavia Machine Co., Hilts & Kennedy, has dissolved partnership and the business has been taken over and will be continued by T. J. Kennedy.

RACINE, WIS., Nov. 21—The entire force of the Mitchell-Lewis Motor Co. of Racine, Wis., has been placed on a ten-hour workday schedule. For some time the plant has been running eight hours a day, but the increase in the demand has forced the company to lengthen the workday and add more workmen.

CLEVELAND, Nov. 21—The business formerly conducted by the Auto Electric Co., 227 Jefferson avenue, Detroit, selling agents for the Willard Storage Battery Co. of Cleveland, Ohio, will in the future be conducted as a factory branch of the Willard Storage Battery Co., under the management of Max Hillman, formerly of the Auto Electric Co.

MANNHEIM, GERMANY, Nov. 11—Benz & Cie Rheinische Gasmotorenfabrik A. G. announce that Director Nammesfahr has retired from the management of that company.

Book Reviews

"EDISON: HIS LIFE AND INVENTIONS," IN WHICH ARE SET FORTH MANY HITHERTO UNKNOWN HAPPENINGS IN THE CAREER OF THE GREAT INVENTOR; "THE ART OF AVIATION," AND OTHER BOOKS

"EDISON, HIS LIFE AND INVENTIONS," Harper & Brothers, two volumes, 472 and 516 pages respectively, blue pebble cloth, gilt top and lettering, uncut edges, large type, charmingly illustrated, 16mo, and conspicuously good printshop work. The price is $4.00 per set.

EDISON, of popular conception, is not destroyed in this work; its virtue lies in its clearness of the putting of a long series of potential incidents, beginning with telegraphy before the war, following through the "great internal struggle," describing many amusing scenes not without their instructive side, with Edison in the foreground.

The first volume takes up "the age of electricity," presents Edison's pedigree, his boyhood days at Port Huron, Mich., are dwelt upon; it is pointed out how Edison as a telegrapher was none too satisfactory in view of his penchant for experimenting. From the crude instruments of war-time telegraphy to the stock ticker, and the introduction of automatic, duplex and quadruplex telegraphy, form intensely interesting chapters; then comes the telephone, for which Edison has done so much, to be followed by the motograph and microphone.

Perhaps the early struggles with the phonograph will hold interest for the average reader, but the coming of the incandescent lamp, coupled with the many ramifications of electric lighting, including the "world hunt for filament material," the contriving of a complete system of lighting, and the building of the first Edison station are all matters that make interesting and instructive reading, from the point of view of the audience without class or distinction. These were days devoted to the making of history for the historian, romance for the romancer, and the foundation of the greatest industry that the world has ever known. The first volume ends with the electric railway, but in closing the book reluctantly, Edison, as a boy, and his ambitious effort in the publication of a weekly newspaper known as the *Herald*, is one of the incidents that occupies a prominent position in a vast array of agreeable memories.

The second book opens with Edison at the office door of the ore-concentrating plant at Edison, N. J., presenting a characteristic likeness of the man who prefers to be known as an inventor, at a time when invention almost failed. It was at this period in Edison's life when the world discovered that his process of elimination, instead of being empirical, as some were wont to say, took on the form of a cold critical turning over of every stone for a mile on each side of the pathway which led from the birth of an idea to the absolute end.

Edison turned to the making of Portland cement when he found that his success in the magnetic ore milling field was not approved by nature. He must have concluded that if New Jersey as a State held too little of the magnetic ore to render his separator commercially valuable, that there was at least enough of raw materials to permit him to carry out a large idea, involving Portland cement, and the casting of the poor man's dwelling on a basis so well contrived that the rich man would look upon it with envy. But the scenery shifts; the great struggle for the perfection of motion pictures was entered into, resulting finally in the erection of 5-cent theaters in every hamlet, everywhere, which, as an educational undertaking, ranks next to the Bible.

Every automobilist will be interested in the storage battery development, and Edison's method of going about it, he having decided not to use all the things that seem to have crept into storage batteries up to that time, holding, as he said, to the idea that Nature must have one or two unexplored secrets. While these volumes should prove of absorbing interest to every man who has had to do with the building up of the electrical art, and to those who like a good story, there still remains scattered all through these two volumes the best exposé of the vicissitudes of the inventor that has yet been put into print. Edison not only tells of his inventions and how he perfected them, but he also offers the best school of experience of the inventor, his pitfalls and tribulations, that can be constructed from the cloth of experience.

No budding inventor can afford to risk his time, money, and future happiness on a voyage bent on invention and exploitation without first ascertaining how the inventor himself is exploited by his friends and his enemies alike, and how he is likely to deceive himself at every turn with disappointment as the most promising reward. The history of Edison's work is rich in lore of the Patent Office, crammed to the brim with reminiscences which partake strongly of the wiles of those who have ever made it a practice to feed upon fat from the brains of inventors, and, with a certain nonchalance, busy themselves thereafter in weaving a romance around their alleged ancestors, paying the score from the ample fund that the inventive mind stands sponsor for. They are fine books for the inventor to read; if he has experience they are even more attractive, nor is it strange that there should be a groundwork for absorbing interest in these same books for the man who simply wishes to be amused and entertained.

"THE ART OF AVIATION," by R. W. A. Brewer. McGraw-Hill Book Company, 239 West Thirty-ninth street, New York City.

In view of the intense interest in the navigation of the air and its rapid development, the issuance of a practical handbook upon aeroplanes and their engines is a peculiarly appropriate and timely work. Mr. Brewer in his carefully compiled book traces the history of the heavier-than-air flying device from the popular viewpoint. While the technique of the volume is profound, it is purposely couched in terms easy of comprehension by the layman. A chapter is devoted to learning to fly and another to the general principles of flight, while the mechanical sections describe in minute detail the various types of engines adaptable to aeroplanes and structural plans of several of the leading varieties of machines.

"LEAVES FROM A MOTORIST'S LOG BOOK."

A most interesting account of a 4,000-mile trip through France, Spain and Italy, taken by Walter Hale and party in a stock Studebaker car, has been issued by the Studebaker Automobile Company. Mr. Hale's notes are illuminative and there are recounted dozens of entertaining and amusing incidents, all in terse style. Many valuable hints are conveyed to tourists who contemplate similar trips, for Mr. Hale's powers of description are of a high order and his observation of passing conditions was evidently comprehensive. Tabulation of the expense of operating the car during the whole trip shows that the actual cost was 2 4-5 cents for each passenger each mile. Fred Niblo, who accompanied the party, took a number of fine photographs and moving picture films, some of which are used to illustrate the book.

"IN UNFAMILIAR ENGLAND," by Thos. D. Murphy. Press of L. C. Page & Company, Boston.

As the name implies, the author has endeavored to bring out the most interesting points of England which the average tourist does not see, and about which nothing much has heretofore been published, touching lightly on what he calls "tourist frequented spots." This book will be found a most excellent guide to the tourist, and at the same time contains a wealth of information of historical interest. It deals more particularly with the author's travels in England, and also contains a brief résumé of his trip through Scotland and Wales, omitting nothing which should be of interest to the tourist traveling through these two arms of Great Britain. The book is also beautifully illustrated with sixteen full-page color plates and forty-eight duogravures of a character certainly more sumptuous than will be found in similar publications. As an appendix are included two folding inserts of maps, one of England and Wales, and one of Scotland and Ireland. These maps show in red lines a number of suggested touring routes which will be helpful to the autoist.

"REPORT OF STATE (N. Y.) COMMISSION OF HIGHWAYS."

Ever since the enactment of what is known as the "Money System Act" in 1898, by which the State obligated itself to pay to the various towns that abandoned the antiquated idea of working out the road tax a sum equal to 25 per cent. of the road taxes that were collected in cash, the highway system of New York has made a number of radical improvements in the character of the roads. These improvements are partially accountable to the operation of the so-called Higbie-Armstrong Act, which provided State co-operation to the extent of 50 per cent. in the cost of building improved roads. The road laws were amended in 1909 so that 100 per cent., instead of 25 per cent., was paid to the towns that collected their road taxes in money, and gave the State Engineer and Surveyor supervisory powers over the expenditure of the road taxes.

The foregoing is a brief résumé of the evolution of highway legislation in New York, which is detailed in the preface of the above-named volume. The work contains the first annual report of the commission, which recommends among other things that 500 miles of roadway be built annually, at a cost of $1,000,000. It shows the organization of the Highway Commission, and contains detailed reports on road construction and material. One table submitted is particularly illuminative. It shows the cost per mile of road construction in every county in the State. This ranged from $5,900 a mile in Niagara to $14,000 a mile in Oswego County. The total expenditure by the State up to January 1, 1900, for road improvements totals about $11,000,000.

Under the caption "Report of the First Deputy Regarding the Maintenance and Repair of State and County Highways" the results of experimentation with various kinds of road materials are set forth in detail, as well as a summary of the work actually accomplished. The report of the second deputy shows the supervision of town highways. According to the financial appendix the expenses of the administrative offices were $103,554, and those of the six divisions and two bureaus $394,224; those of the district superintendent $582, and for furniture and supplies $50,836, while the expenses of the Bureau of Town Highways cost $57,158 and the Bureau of Maintenance and Repair under it $49,207, making a total of $655,561 for salaries and expenses of the State supervision. The commission expended $3,771,000 on road construction. The report is the same as that transmitted to the Legislature January 12, 1910.

With the Commercials

LIST OF EXHIBITORS DURING THE SECOND WEEK OF THE A. L. A. M. SHOW—THE PENN-UNIT DELIVERY—OTHER NEWS OF INTEREST

WITH thirty-four exhibits of freight trucks and a comprehensive show of electrics, motorcycles and accessories the second week of the A. L. A. M. show at the Garden promises to be a memorable and historic affair. The manufacture of trucks has made big strides in the recent past and the line of cars to be shown is the largest ever gathered under one roof. The full list of motor trucks is as follows:

Morgan	Pierce-Arrow	Lozier
Knox	Hupp-Yeats	Feerless
Hewitt	Autocar	Reliance
Rapid	Sampson	Grabowsky
Lansden	Studebaker	White
Packard	Mack	Alco
General Vehicle	Anderson	Buick
Cartercar	Courier	Glide
Franklin	Reo	Brush
Overland	Atlas	Randolph
McIntyre	Garford	Kissel
Brasier		

The Penn-Unit Delivery Wagon

As the name implies the Penn-Unit cars are so constructed that in the event of any part of their mechanism getting out of order the particular part can be replaced in a short time without removing the load, or disturbing any other parts of the car. To accomplish this it is absolutely necessary that every part of the chassis should be made to accurate gauge, obviating any fitting on the part of the mechanic who has to replace same, otherwise the utility would be lost. It resolves itself to a question as to whether it is cheaper to keep a separate unit on hand in case of accident or breakage of any part so that the car may be kept in commission or to have to lay the car up and lose the earning power of the vehicle while it is in the shop idle. There is not only the cost of the parts to be replaced but the time the car is out of service. The makers claim that almost every part of the car is made in their own shops, so that they have a control over the standardization and they give an absolute guarantee of interchangeability of parts. The vehicle is made by the Penn-Unit Car Company, Allentown, Pa., in one model to carry a normal load of 1,500 pounds and two men, suitable alike for the owner of a fleet of cars and the small trader who has only work enough for one. The unit system will particularly appeal to both as the latter is always sure to have his deliveries made and the former require less space for repair shops, as the units can be changed where the car stands in the ordinary way. The maximum speed of the car is 18 miles per hour, and the price of the truck as illustrated is $1,900.

This power unit consists of the motor, clutch, magneto, carbureter and oiling device, all of which are assembled on a sub-frame independently of the car-frame members. By removing two bolts and breaking several connections the complete unit can be drawn forward until it is completely detached from the car. The motor is of the two-cylinder, four-cycle opposed type, 20 horsepower (A. L. A. M. rating), water cooled, 5-inch bore and 5-inch stroke. Each cylinder casting forms one-half of the crankcase, making a very rigid construction. The cylinders are bored and ground to within 1-1000 part of an inch. The valves are mechanically operated. The crankshaft is made from a one-piece drop-forging, heat-treated, and ground to size. The large main bearings are of Parson's white brass.

The motor lubricating device is extremely simple and beyond the control of the driver. A constant supply of lubricant is fed through a sight-feed manifold to the main bearings and pistons, the overflow returning to a specially formed splash chamber in the crankcase wherein a constant level of oil is maintained. Any overflow is filtered and returned to the main supply reservoir.

The clutch is a special application of the Hele-Shaw clutch, made up of 21 corrugated pressed discs alternately phosphor bronze and steel.

A Bosch high-tension, gear-driven magneto furnishes the current for ignition, thereby eliminating the use of batteries, wiring, coil box, commutator and extra set of plugs. A Stromberg carbureter of the float-feed, constant-level type is provided.

The power unit is suspended at three points. Any undue distortion of the frame or stresses that the car may be subjected to will not be transmitted to the power plant.

The transmission is of the selective sliding-gear type, with a range of three speeds forward and one reverse.

The gears and shafts are made from chrome-nickel steel, heat-treated, hardened and ground. Double-row, annular ballbearings are provided throughout. There is no chance for leakage of oil and grease from the transmission, as there are no joints below the level of the lubricant. The Penn-Unit car has a straight-line drive which eliminates the use of power-consuming universal joints and gives a longer life to the wearing parts. The transmission case is made of an aluminum alloy, the tensile strength of which is 44,000 pounds to the square inch.

The differential is included in the transmission unit and is an integral part of same. Jackshafts and bearings are enclosed within seamless steel tubing, which not only adds strength but retains the lubricant and excludes dust and dirt. The jackshafts are of the semi-floating type and can at any time be withdrawn from the car without disturbing any other part of the construction. The transmission, differential and jackshafts together form a complete unit, suspended at three points similar to the power plant and can be dismounted entirely from the car quite as readily. Final drive is by means of two side roller chains direct to the rear wheels.

The braking system provides two sets of brakes, both being positive in their action and independent of each other. They are of the internal-expanding type and are mounted in large pressed-steel drums on the rear wheels. The drums are dust and waterproof. The expanding shoes are covered with an asbestos material.

The steering mechanism is of the irreversible worm and sector

Penn-Unit Delivery, in which speedy replacements may be made without removing load

type with ball thrust bearings and eccentric bushes to take up wear. The entire control is on the left side of the car, giving the driver an unobstructed passage from the seat to the sidewalk, facilitating the quick delivery of goods.

The frame is made from chrome nickel steel pressed cold with a 4 x 1-2 inch channel section, rigidly braced by a number of cross-sections and four gusset plates of large dimensions reinforce the corners of the frame.

Front springs are semi-elliptic, 2 inches wide, 38 inches long. Platform springs, 2 inches wide and 42 inches long, are used in the rear. Graphite is placed between the leaves before assembling, and all spring shackles are fitted with oil cups. The spring eyes are fitted with Tobin bronze bushings and can be replaced any time at very small cost.

Axles are forged from high-grade steel and the hubs are fitted with ballbearings.

The sizes of the front wheels are 36 x 2 1-2 inches and rear wheels 40 x 2 1-2 inches. Wheelbase 90 inches and track 56 inches.

Cooling is accomplished by the simple and efficient thermo-syphon system, eliminating the water pump. A honeycomb radiator of large capacity is mounted directly over the motor and need not be removed or disturbed in any way when removing the power plant.

The gasoline tank is placed under the driver's seat and has a capacity of 12 gallons, 2 gallons always being held for an emergency by a novel device.

The standard carrying space for freight is 80 inches in length and 44 inches in width, but if desired the platfrom can be lengthened to 96 inches.

Four-Cylinder Rapid Truck Announced

PONTIAC, MICH., Nov. 21—The Rapid Motor Vehicle Company, of this city, has begun the construction of a new truck. A sample truck, which is the design of Engineer F. C. Frank, has been in use on the streets here. The new Rapid is of two-ton capacity and has the engine under a hood on the front of the car instead of under it. The engine is of the four-cylinder type. The new model, after being thoroughly tested, will be exhibited at various automobile shows throughout the country. It is planned to ultimately discontinue the manufacture of the old two-cylinder truck.

Syracuse Dealer Swells Auto Line

SYRACUSE, N. Y., Nov. 21—The Willis Motor Car Co. plans to enlarge its sales organization during the coming year, and instead of three will represent seven cars. The Selden and Baker Electric, which the Central Auto Sales Co. has previously represented in Syracuse, will be taken over, and J. Rathbun, who has been local manager for the former company, will be garage manager of the Willis concern. The Oldsmobile and Oakland pleasure cars and the Rapid and Reliance freight automobiles comprise the remainder of the line.

Thomas Creditors Not Discouraged

BUFFALO, Nov. 22—Creditors of the E. R. Thomas Motor Company, who have been in session since yesterday, declare that they are convinced that the company is not insolvent and state that there is much to encourage them in the situation. The business will be continued and the records of the company show that orders are coming in beyond the capacity of the plant to fill.

A plan has been perfected to place the company on a satisfactory financial basis, but the details of the plan will not be announced until the latter part of the week. The meeting will continue through to-morrow, when a recess will be taken over the holiday. It is though that the whole matter will be worked out by Friday night.

New Plant for Windshield Company

The Troy Carriage Sun Shade Company, of Troy, Ohio, has just built another factory in which will be manufactured exclusively the Troy automatic windshields and speedometers.

This plant is of gray steam-pressed brick, and will contain the general offices of the system.

Brief News from the Commercial Field

—The Dixon C. Walker Automobile Company, of Baltimore, Md., has taken on the agency for the Grabowsky Power Wagon Company.

—J. V. Dillman, formerly with the Wentworth Motor Car Company, has accepted the sales management of the Atterbury truck line for the American Auto Sales Company, 5015 Euclid avenue.

—The Columbus, Ohio, Motor Car Transportation Company, of Columbus, Ohio, was incorporated recently with an authorized capital of $100,000 for the purpose of operating a number of motor buses on the streets of Columbus.

—The S. Mack Motor Truck Company, of Baltimore, Md., was incorporated in Dover, Del., with a capital stock of $50,000. The incorporators are J. J. Smith, of Baltimore; Harry C. Yarrow, Jr., George Yarrow, and W. K. Yarrow, of Philadelphia.

—A Commercial Truck Show will be given in Pittsburg from April 4 to 8, 1911, under the auspices of the Automobile Dealers' Association of Pittsburg. The regular pleasure vehicle show will be held March 25 to April 1. Both will be in Duquesne Garden.

Electric Sound Signalling

ILLUSTRATING THE DETAILS OF THE EQUIPMENT WHICH IS USED TO TURN ELECTRICAL ENERGY INTO SOUND FOR SIGNALLING PURPOSES

ENERGY, of which there is a fixed quantity in the universe, is rendered manifest in various forms and may be converted from one to the other with more or less efficiency. The greatest storage battery in nature is represented by a ton of coal, storing in its mass 28,000 British thermal units of heat, all of which originated in the sun of our universe and was transferred across interplanetary space in the form of "radiant" energy with substantially no loss. There seems to be no authoritative statement of the precise efficiency of the transmission of radiant energy in the luminiferous ether, which is a body of a jelly-like consistency that permeates all space, even into the interstices of the elements and compounds as they obtain on the earth. The fact that radiant energy is transformed into energy in the form of heat by mere contact rather goes to show that just a little of the radiant energy may be transformed into heat, electricity or other vibrations as it traverses the luminiferous ether, the latter having body and substance, however attenuated; the density of the luminiferous, ether being estimated as producing a pressure of one pound per square mile on the surface of the earth.

It might be said that all these scientific problems are remote from the proper consideration of a mere device for use in signaling work, and yet the difference between a disagreeable noise and

an efficacious signal is represented in the mere adaptation of the means at hand, and the intelligence displayed in working out the details. It is true that the man who rides in the driver's seat of an automobile and who presses the button when he desires to indicate to a pedestrian that he is in too close proximity to a moving automobile may be quite satisfied if his effort produces the desired result. He may never know that the desired result has two phases, one of which is represented in the agreeableness of the sound from his point of vantage, and the other in the fact that the pedestrian is warned, which he indicates by moving out of the way. Were the sound improperly produced, it would pile up around the automobile, becoming a mere disagreeable noise to the occupant of the seat, failing utterly as a warning to the pedestrian ahead. When the sound is efficiently produced there is barely enough of it given off in the immediate vicinity of the automobile to tell the driver that he has done his part, and the major portion of the wave is projected for a distance ahead, thereby serving as a necessary warning signal. Under efficient conditions the sound produced is agreeable to the ear of the occupant of the automobile, partly because there is so little of it from his point of vantage and again on account of the rate of vibration and the tone produced.

From the designer's point of view, under the circumstances, it is necessary for him to know all there is of knowledge in relation to energy and its transformation; he traces the energy of the sun as it was vibrated across space, perhaps in the carboniferous age, or long before, resulting in the chemical reduction of vegetation, due to contact with the sun's rays, and, in view of the processes then going on in the formation of coal, which, as before stated, became Nature's storage battery.

Following along in the process it was logically deduced that the energy stored in the coal could be unlocked by the application of heat and perhaps by chemical transformations and electrolytic work, which, according to the law of the conservation of energy, could be transformed into light, heat, electricity, sound and the mechanical equivalent, work.

When James Watt unraveled the philosophy of the tea-kettle and reached the conclusion that the steam rushing out of the spout held a force that could be turned to good account he furnished the groundwork for steam engines, by means of which the energy, as it is stored in coal, may be turned into mechanical work. Analytical chemists had their curiosity aroused, and they said: "If Watt can get power out of water by turning it into steam, the question is, where does it come from?" It required no analysis to show that he put a fire under the kettle, and that coal was the fuel, and so it became a mere matter of determining how much energy there resides in coal, and the British thermal unit of heat was ultimately established as the means of definitely measuring the same. The value of this heat unit is equal to that amount of energy which will raise the temperature of 1 pound of water 1 degree Fahrenheit at the point of its maximum density, which is 39.1 degrees. In the investigation of coal it was ascertained that the heating value is not the same in all samples, and that it varies considerably under the different conditions in every commercial grade, but it was finally concluded that a good average sample of coal should give up 14,000 British thermal units of heat when it is burned to complete combustion, resulting in carbonic acid, water and ash—so much for steam.

In 1801 some of the leading physicists discovered that by chemical action and reaction it was possible to produce electricity, and the storage battery, as it is known to-day, took form. Commercially, the electrochemical art, as it is represented in the storage battery, languished until perhaps 1860, when M. Gaston Plance commercially produced a type of storage battery that made it possible to utilize considerable quantities of energy from coal, storing it in the lead plates by an oxidizing process, giving it off, more or less at will, in the form of electricity. There are definite means at hand for determining the equivalent value of the energy as it resides in coal, in mechanical work as it is produced by a steam engine, or electrical energy as it is given out by a storage battery, and then, too, there is the method of taking the mechanical work of a steam engine, utilizing it to drive dynamo-electric machines in which electromagnetic process the energy originally residing in the coal is passed through succeeding cycles, as follows:

(a) The coal is burned under a steam boiler.
(b) The steam is passed into a steam engine, and its energy is utilized to drive the same.
(c) The mechanical work of the steam engine is used to drive the dynamo-electric machine.
(d) The dynamo-electric machine delivers equivalent electrical energy.
(e) The electrical energy may be used for lighting, heating, power purposes, electrochemical transformations and signaling, as in the Klaxon horn.

It is only a step from the consideration of coal as the source of energy to the utilization of gasoline as an equivalent source of the same energy. If coal is Nature's storage battery in the solid state of aggregation, gasoline (hydrocarbon liquids) is Nature's secondary battery in liquid form. It is convenient to use gasoline instead of coal because the fire is then built directly in the cylinder of the motor instead of being kindled under a boiler, requiring a ramification before the energy can be transformed into mechanical work. Nature foresaw the many wants of man and provided for them in divers ways; not the least of which is represented in the automobile, utilizing liquid fuel rather than coal.

Having thus roughly traced the energy that is used in the propulsion of automobiles from the dawn of day down to the present time, it remains to deal with contemporary and familiar things and to come to the point, calling attention to the fact that the underlying principle of the Klaxon horn relies upon the utilization of the energy as it was radiated from our sun of remotest time, transforming it by means of a battery into electricity, and then by the horn into sound, or instead of a battery a dynamo-electric machine is connected mechanically to the automobile motor and is driven thereby, furnishing the necessary electrical energy for actuating the horn in the production of sound. Briefly stated, then, the signal as given may be traced back to the energy of the sun by the man who knows, but from the point of view of the man who does not know, it is produced by pushing a button.

It will be apropos just here to describe the Klaxon horn, showing its details of design and construction, telling how it serves as the transformer of energy, resulting in the production of controlled sound for warning purposes, utilizing electricity as the immediate form of energy.

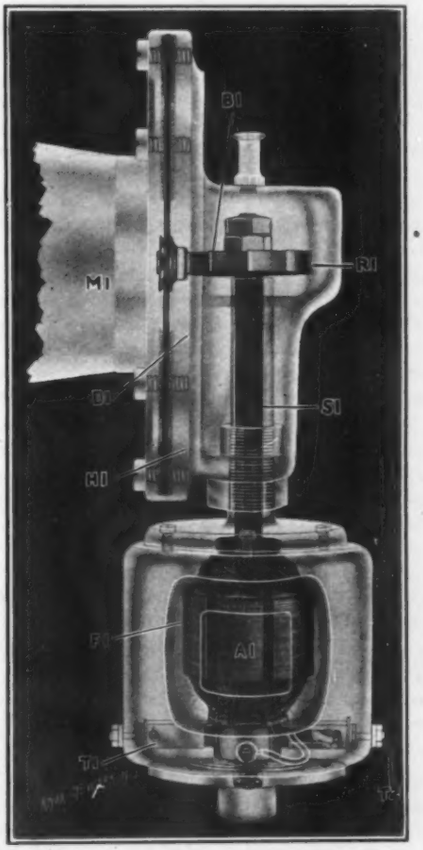


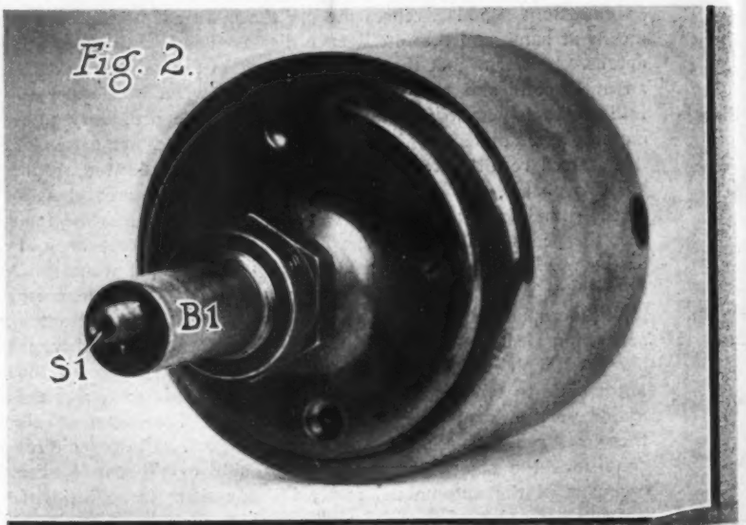
Fig. 1—X-ray of the Klaxon horn, showing the armature and knocker in relation to the diaphragm

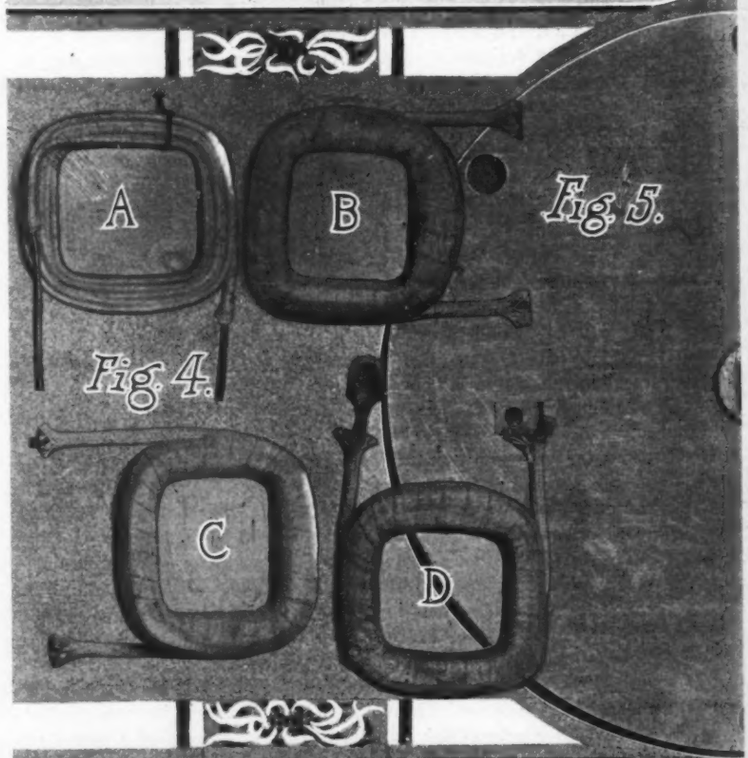
Referring to Fig. 1, the device is shown complete, with the field F1 of the motor resting in the vertical position, and the armature A1 revolving within the field, with its spindle S1 projecting up and a ratchet R1 keyed to the end thereof. The teeth of the ratchet make contact with the button B1, which is centrally located in the diaphragm D1, the latter being in the housing H1, to which the megaphone M1 is also fastened. Electrical energy is applied to the terminals T1 and T2 when the motor becomes energized, and the armature A1 rotates in response thereto. This rotation is imparted to the ratchet wheel R1, and the latter being eccentrically disposed, the teeth thereof synchronizingly contact with the hardened button B1 of the diaphragm D1, setting up vibration therein. It is this vibration which pushes the air in and out of the megaphone, producing waves, and they, being of a predetermined length and amplitude, produce sound of the desired pitch, intensity and *Klangfarbe*. But this is not all. The sound must be produced where it is wanted. It is not wanted in the ear of the man who is driving the automobile, but it is desired to awaken the person ahead, warning him of the approach of the automobile, telling him (not to get out of the way) to obey the law, and keep to his proper side of the road, permitting the approaching automobile to go on its way in safety without endangering others. In order to accomplish this latter necessity there is a peculiar condition to be satisfied—the vibrations as they emanate from the megaphone of the instrument must be projected for a considerable distance ahead without interfering with each other, notwithstanding the fact that "complex sounds" have to be utilized. The problem is not different from that which must be solved in the cultivation of the human voice; the refined, well modulated utterances of the famed speaker may be projected for a considerable distance, and yet those who are in the immediate vicinity of the speaker are attracted by the agreeableness of the effort.

A better understanding of the ways and means for arriving at the desired result must of course come with a study of the refinements incorporated into the apparatus. It goes without saying that a crude device like the uncultured voice will evolve a noise, but the introduction of the necessary refinements, coupled with the proper harmony of the interrelating members, is what is needed for the more elevating result. Referring to Fig. 2, which is the shell-like field of the motor, attention is called to the eccentric bearing B1, to which reference was made in describing Fig. 1, showing how the teeth of the ratchet wheel or knocker were brought into contact with the button on the diaphragm. In this case the shaft S1 passes out through the bearing B1 at a point distant from the true axis of rotation, and when the automobilist essays to extend a warning, what he really does is to rotate the whole motor, thus bringing the shaft S1 in closer proximity to the button on the diaphragm, producing a greater or lesser interference, depending upon the amount of sound it is desired to produce.

In order to show some of the niceties of design and construction the armature of the motor is presented in Fig. 7, at A, showing the armature core of the built-up laminated slotted type on its spindle before it is prepared for the windings; B, showing the armature in a further state of preparation; C, presenting the same after it is wound; D, offering another view when the armature is baked ready for the commutator to be mounted into place, and E showing the armature A1 with the commutator C1 on the shaft S1, with the ratchet wheel R1 in place.

It will be understood that there is a great difference between a professionally made commutator as it is employed in standard dynamo building and the improvised affairs which accompany toy motors, and even some that are not supposed to be in the toy class. Fig. 6 shows the commutator of this motor in the finished





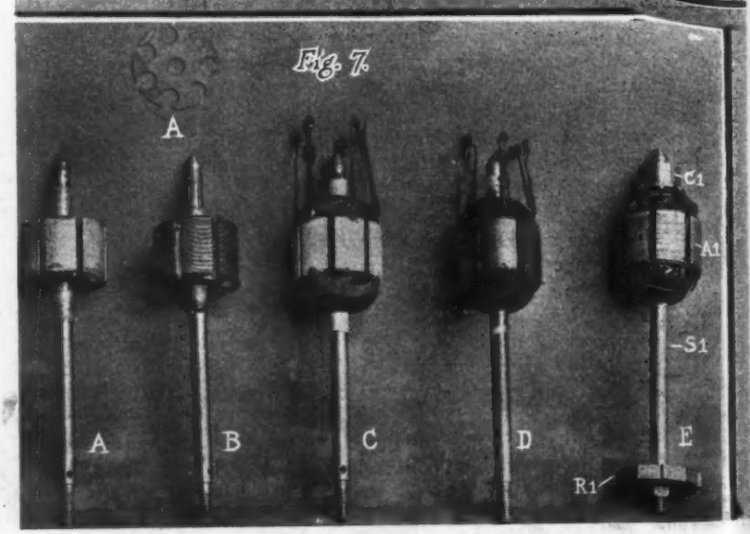


Fig. 2—Exterior view of the motor, showing the eccentric relation of the shaft to the end-bearing

Fig. 4—Field windings in the four states of processing

Fig. 5—Diaphragm of vanadium steel with the button riveted in the center

Fig. 7—Armature shown during the various states leading up to the completed form

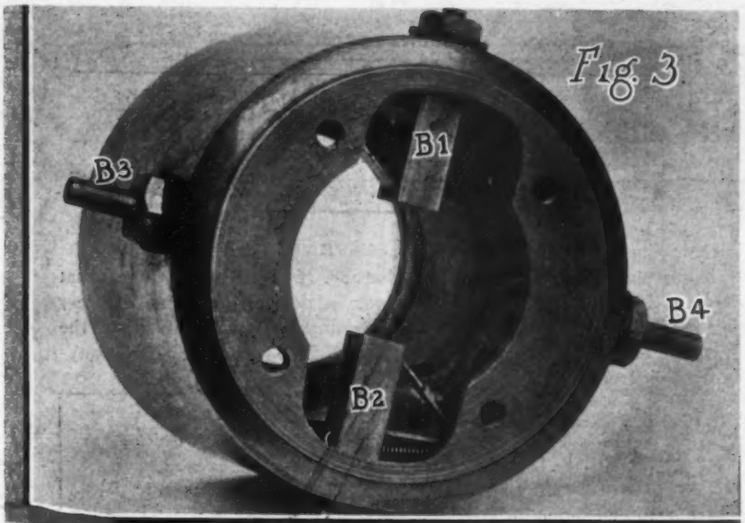


Fig. 3

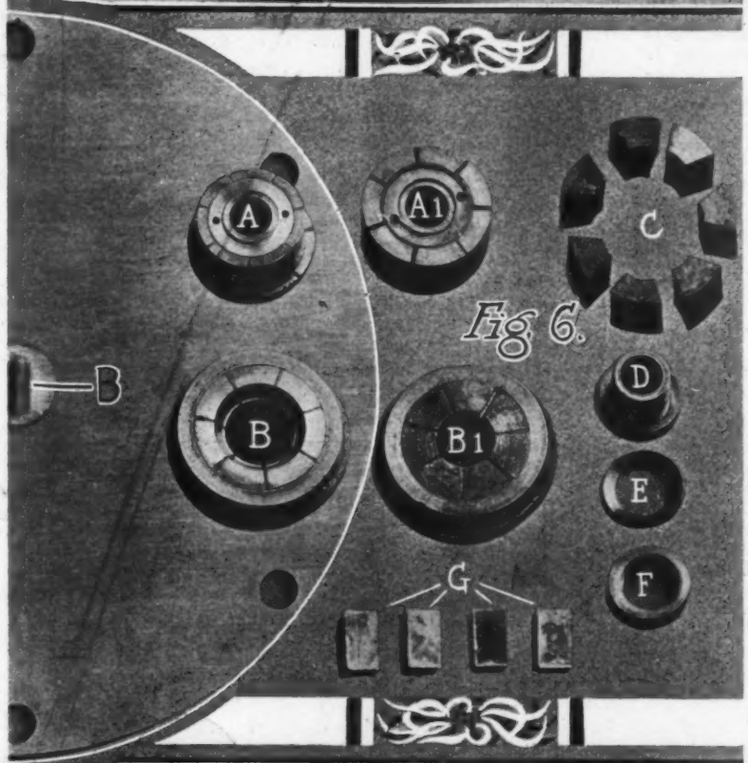


Fig. 6.

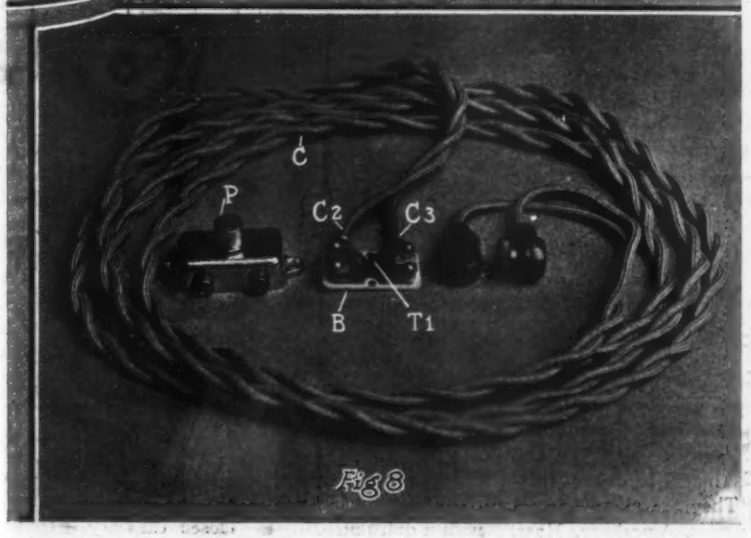


Fig 8

state at A, advanced an operation at A1, after it is turned down in the shell at B and before the turning operation at B1. The segments of the commutator are shown at C and the spool is presented at D. The washer of the beveled type is presented at E and the nut at F, while the mica insulation is shown at G. Experience has proven that the commutator of the little motor used in this work must be put together with the same care as that attending the building of commutators on the largest sizes of dynamos.

The field windings of this motor, of which there are two, look as shown in Fig. 4 during four states of construction, in which A shows the winding alone, B presents the same after it is taped, C shows it shaped up and D when the terminals are soldered on and the baking operation is done. It is the function of these field windings to magnetize the soft iron field, thereby contributing the magnetic quota, which, together with the electric current that flows in the windings of the armature, results in the torquing of the motor, ending in the desired amount of power at the proper speed, remembering, however, that the starting torque must be relatively great and this is assured by connecting the field windings in series with the windings of the armature so that the total current in passing into the armature also passes through the fields, and in view of the fact that the current in amperes increases as the speed decreases, owing to the falling off of the counter electromotive force, the very increase in current that would be fatal to a motor otherwise built saves the situation. Fig. 3 shows the field with the armature removed, presenting the brush holders B1 and B2, by means of which the current is transferred from the binding posts B3 and B4 to the commutator of the rotating member or armature. The field windings are housed in perfectly, thus protecting them from foreign matter and lubricating oil or other rotting substances. Fig. 5 is a near-size view of the diaphragm, which is made of a special grade of steel, showing the hardened button B riveted at the middle and six holding bolts, by means of which the diaphragm is clamped between the two housing members, it being flanked by two insulating pieces, the idea being to preserve the purity of tone of the diaphragm. Sound is produced by the vibrations set up in this diaphragm, as before stated, but despite the fact that it looks like a simple piece of Russia iron, blanked out in dies, the fact remains that it proved to be one of the most troublesome features in the building of this scientific sound producer. It is made of a special grade of steel, alloyed with vanadium, produced by special heats, for this specific work, and after it is blanked out in dies, heat-treated and the button is riveted in, it is then sent to a skilled workman, who lays it on a platen and by the deft use of a suitably contrived pien hammer the internal strains are relieved and it is flattened out so perfectly that the special means afforded for its keen inspection fails to disclose any defect which would interfere with its ability to measure out vibrations of the desired wave length and other characteristics, and it is interesting to observe that one of the requirements is to have the diaphragm absolutely flat, which, by the way, is a difficult accomplishment.

The electrical connections between the battery or other source of electrical energy and the horn, also the connections between the motor and the push button, must be electrically perfect and mechanically protected in order to assure continuity of performance of the instrument. Fig. 8 shows the duplex electric cable C1 that is provided with the instrument and the connections C2 and C3 to the terminals, which are screwed into the base B1, also the tongue T1, which is pressed into wiping contact with one of the terminals when the push P1 is pressed down; nor does it matter how much pressure is exerted, it will be impossible for the operator to disarrange the parts or destroy the wiping nature of the contact.

Fig. 3—Soft iron field—looking at the end with the spider off, showing the brush-holders in place

Fig. 6—Commutator and the parts of which it is built up

Fig. 8—Push-button, terminals and the duplex-flexible cable used in service

Among the Accessory Makers

SHAWMUT TIRE FOR WINTER WORK; BROWN'S COMPRESSOMETER; FLEXIBLE VALVE REMOVER AND GRINDING TOOL; GRAY & DAVIS LAMPS FOR CLOSED CARS

VALVE REMOVER AND GRINDING TOOLS

Two useful valve tools that have been placed on the market by The Flexible Valve Remover Co. of Providence, R. I., are shown in Figs. 1 and 2. The first is a combination screw driver and valve grinder 12 inches long. The knob at the top is on a swivel which lets the rod turn without moving the knob. The handle on the side moves up and down in a groove, thus enabling the operator to work with ease around piping and fittings, adjusting the handle where most convenient to use. The tool is bright nickel and the point is hardened. The price includes a spring for inserting under the valve mushroom.

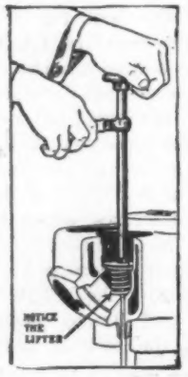


Fig. 1—Combination screw driver and valve grinder

The Flexible Valve Remover (Fig. 2) is made in two sizes, the large one being made extra heavy for big cars, and is 17 inches long. The lever has two slits, one on either side, into which the chain grips and the hooked top presses on the valve head, preventing it from rising when the spring is raised.

TIRE FOR NON-SKID WINTER WORK

The illustration here shown of the new block-tread non-skid tire as manufactured by the Shawmut Tire Co., of Boston, Mass. (Fig. 3) is intended to afford immunity from the customary troubles of Winter automobiling in addition to the service that is the normal expectation of a good pneumatic. The particular interest of the moment is centered in the efficiency of the block-tread, due to its good traction, and freedom from side slip. The tires are made in the several customary sizes, and it is the claim of the company that the fabric employed in the building up of the tire, together with the quality of the rubber and the details of workmanship, are such as to support the good work that the block-tread is responsible for, thus assuring a satisfactory mileage in addition to the other advantages.

Fig. 3—Non-skid tire for winter

REGISTERS CYLINDER COMPRESSION

The usual way to find out whether a certain cylinder has equal compression with its fellow-cylinders is to turn the motor over by the starting handle; but at best this is a poor way, although an experienced mechanic can more or less tell approximately which is the best and which the weakest. The compressometer (Fig. 4) is intended to indicate the exact amount of compression that each cylinder contains when the motor is revolved.

To use the meter unscrew a spark plug, screw the instrument in its place, and turn the motor over by hand. Under no consideration run the motor. The large hand will carry with it the small telltale hand and the latter will remain at the highest point when the meter is unscrewed. By this means each cylinder can be compared. Care should be taken to fit a washer under the meter in the same way as a spark plug; otherwise the reading will not be correct. The instrument is made by the H. W. Brown Co., of Syracuse, N. Y.

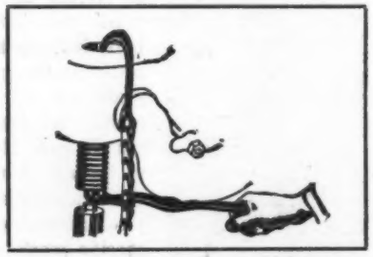


Fig. 2—Flexible valve remover

LAMP FOR CLOSED CARS

The lamp illustrated in Fig. 5 is known as a pillar lamp, and is designed for closed and limousine cars. Besides looking smart during the day, its object is to illuminate the step and door of the car, and being electrically lighted, the objections to oil lamps in this position are done away with. It can be furnished in all brass or brass with a black enamel top, and is equipped with six-volt, four-candlepower bulb and cut-out plug. It is made to take round holder or bracket. They are manufactured by Messrs. Gray & Davis, Amesbury, Mass.

TO FRUSTRATE THE MEDDLERS

Cars that are fitted with switches that one can lock in the "off" position are less likely to be tampered with than when the switch is one of the ordinary kind that anybody may turn on and perhaps start the engine. The New York Coil Co., 338 Pearl St., N. Y., has perfected such an anti-meddler switch with which genuine Yale locks are used, three keys being supplied. The switch must be turned in the off position before the key can be removed. The combination is for two sets of ignition, either two batteries or magneto and battery.

Fig. 4—The Brown compressometer

WATERPROOF AUTOMOBILE GARMENTS

A new waterproof material that has been creating quite a sensation on the European market is now being introduced into America, the sole manufacturers in this country being the Rubbinol Raincoat Company, 1777 Broadway, New York City. Besides raincoats, this concern makes capes, sleeve protectors, aprons, leg protectors, cap-hoods, gloves, etc. "Rubbinol" closely resembles rubber, but is much softer, lighter, non-crackable and better-looking. Besides being one of the lowest-priced materials on the market it is absolutely waterproof, oil-proof and gasoline-proof, the last-mentioned qualities making it more desirable than rubber. The color is black, with a dull finish.

Fig. 5—Pillar lamp for closed cars